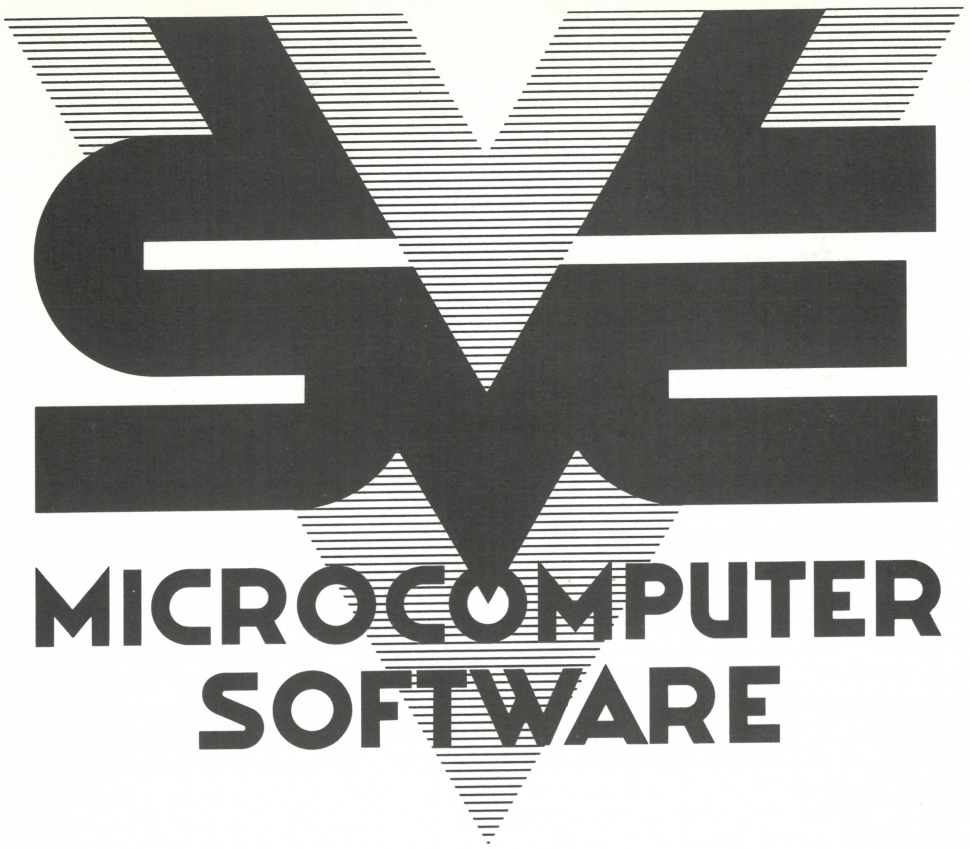
Teacher's Manual

Guinness World Records Problem Areas in Math
20030—TG

SVE / Society For Visual Education, Inc.
1345 Diversey Parkway • Chicago, Illinois 60614

A Business Corporation



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IMPORTANT NOTICE

In order to improve the attractiveness and readability of these microcomputer programs and to provide students with uppercase/lowercase type displays, SVE has replaced the standard low resolution, all uppercase APPLE text with a special high resolution character set. This character set also permits us to load text on and off the screen very quickly, to use color coding for emphasis, and to employ high resolution graphics throughout the programs. Our tutorial and exercise sections make very effective use of these special features.

We regret that these major advantages are accompanied by one drawback: the imperfection of a few characters in the smaller size character set. Students should know, for example, that the lowercase *m* may on a few programs and on some monitors be difficult to distinguish from an *n*, particularly in color, and that occasionally the *o* and *a* may be difficult to tell apart. Wherever possible, we have corrected these problems, but we apologize for any difficulties these imperfections may cause.

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Guinness World Records Problem Areas in Math
(For use with 48K Apple II Microcomputer 3.3 DOS)
To preview disks please see "Preview Instructions" under Operating Instructions

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INTRODUCTION

COMPONENTS

1 4 microcomputer disks for Apple II, 48K, 3.3 DOS
2 Teacher's Manual
3 Class Records Sheet
4 Student Information Sheets
5 Student Progress Sheets
6 Management System Reference Sheets
7 32 Skill Sheets

PURPOSES

- to offer students number and word problems which address two specific addition skill deficiencies: adding large numbers and adding numbers in jagged columns
- to offer students number and word problems which address two specific subtraction skill deficiencies: subtraction involving regrouping and subtraction involving zero in the minuend
- to combine tutorials, drill and practice, and instructional gaming in a manner that engages and challenges students
- to provide a disk management system which provides lesson shaping and record-keeping

DISK FEATURES

Educational Approach

This series covers specific trouble areas in two basic math operations: addition and subtraction. Addition and subtraction are covered in two disk formats: on a mastery disk and on an application disk.

The mastery disks carry the main load of the teaching and practice. They each offer eight lessons, including appropriate tutorials and practice questions. The lessons are labeled A-H. Lessons A, B, C, and D offer number problems in two specific trouble areas, while lessons E, F, G, and H offer word problems in these same trouble areas. Students can be assigned less or more difficult problems in each trouble area. Assignment options are listed on a menu format, and lessons may be given out on a class or individual basis.

The two application disks do not require teacher set-up time, and are primarily designed to give students additional practice in solving number and word problems in an exciting game format.

All of the disk programs are ready to use and easy to follow. Student directions are contained in each program; the student is given immediate feedback as to whether his or her response to each question is correct. Step-by-step tutorials are also available for each problem. Total scores are provided at the end of each lesson.

Individualized Learning

These disk programs have the capacity to offer each student a personally customized learning sequence. A typical mastery disk lesson consists of five problems, with a tutorial available for each problem if needed. Lessons are self-paced with immediate feedback, correction, and reinforcement. Students control pacing with the space bar and the return key and are never rushed. Examples and directions are optional, depending on student preferences. As it stands, these disks are menu-driven, allowing students free choice to shape their own lessons. But the management system offers the teacher specific lesson shaping options. These options allow teachers to address specific skill deficiencies and motivational needs. If a teacher wishes, he or she may:

1 Shape a lesson for students who need to be continually challenged by progressively more difficult problems. Do this by setting a low branching percentage. This sends students to higher level problems as quickly as possible.
2 Shape a lesson for a student who will benefit from staying at the same level problems for a long time. Do this by setting a high branching percentage.
3 Set a starting level, and then let students move along on their own.
4 Let students shape their own lessons.

Management System

On the mastery disks, the management system is designed to provide a balance of record-keeping and lesson shaping options. In terms of storage space on the mastery disks, teachers may store up to 90 student records on one or more class files.

Teachers who wish to customize lessons on the mastery disks to meet individual needs should refer to the Content Correlation Chart, Lesson Content Sheets, and the Management System writeups in this manual. Teachers may make individual and/or class assignments, or students can work by themselves directly from the lesson menu.

On the application disks, the management system operates differently. Names, rather than passwords, are stored. All names are kept on a single class file which holds up to forty names. Students may leave the disk at any point and then return later and resume at the place they left off.

See Management System section in this manual for specific details.

Guinness World Record Statistics

Guinness World Record facts are used to motivate

and engage students on all of the disks and on most of the Skill Sheets. On the mastery disks, fascinating Guinness facts are linked with problem sums; when a student inputs a correct answer he or she is rewarded with a Guinness fact involving that number. As these unusual statistics instill curiosity, they also serve to show how statistics are applied to real life feats. Guinness facts also form the basis of the word problems, and are tied into the game themes on the application disks.

Exciting Themes with Graphics and Sound

The graphics and sound offered on these disks are intended to maximize the visual and auditory capacity of the computer to interact with students. Wherever needed, color and animation serve functional purposes. Animated examples and tutorials, as well as visually appealing directional screens, are used to inform and motivate students. Each disk has an original graphic theme. Characters such as the "Mathstermind," "King Minus," "Subtracto," and the "Space Grogs" create curiosity and in some cases are metaphors for mathematical concepts. Games are built into the reward strategy on the mastery disks, but especially on the application disks. These games involve fantasy, challenge, choice, random events, and other appealing elements. Importantly, sound is offered as an optional feature.

SKILL SHEETS

There are 32 reproducible Skill Sheets for this series. The sheets include exercises and activities which draw upon and complement the content of the disks. Also, selected skills not addressed on the disks are covered on some of the sheets. The reading level for the disks and the Skill Sheets is approximately 2.5 to 4.0.

SUPPLEMENTAL TOOLS

The package accompanying these microcomputer disks includes supplemental material designed to help teacher and student get the most out of the programs. The *Content Correlation Chart* sets forth the educational objectives covered in this package, and lists the components which deal with each objective. The *Lesson Content Sheets* have a similar purpose but a narrower focus: each of these sheets shows how the lessons on one of the disks correlates with the educational options offered to the teacher. The *Content Correlation Chart* and the *Lesson Content Sheets* are located in this Teacher's Manual. The *Management System Reference Sheets* serve as a quick and simple reference guide to the Management System. The *Class Records Sheet* is also designed for use with the Management System – its format parallels that of the Management System's class records screen. The *Student Information Sheet* and the *Student Progress Sheet* are for the student's use. The first of these tells the student all he or she needs to know in order to run the programs properly; the second gives the student a format in which he or she can keep performance records for each use of the disks. The *Management System Reference Sheets, Class Records Sheet, Student Information Sheet,* and the *Student Progress Sheet* are looseleaf, reproducible, and located in the back of the package.

GRADE LEVEL

The series is geared for grades 4-6, but is a high-interest program which can be used by students working on level or by older students as a remedial tool.

PREREQUISITE SKILLS AND ORDER OF PRESENTATION

This is a supplemental math series, one which is ideally used in conjunction with classroom teaching or review of addition and subtraction skills. The program can be used most effectively to teach, review, and reinforce skills related to specific areas of difficulty in addition and subtraction. Teachers who know exactly where students are having difficulty can send them directly to problems designed to give practice in that area.

In regard to the order of presentation, the mastery disks are designed to precede the application disks. However, students who simply want practice with addition and subtraction problems may use the disks in any order.

CONTENT CORRELATION CHART

Below is list of the skills covered in the *Guinness World Records Problem Areas in Math* program, with appropriate disk lesson and Skill Sheet reference numbers.

Content
Guinness World Records Problem Areas in Addition, Parts 1 and 2 (Mastery and Application Disks)

Skills	Mastery Disk Lesson	Skill Sheet
Adding large numbers, number problems		
• 2 addends, no regrouping	A	
• 2-3 addends, regrouping	C	3, 12
Adding large numbers, word problems		
• 2 addends, no regrouping	E	
• 2-3 addends, regrouping	G	9, 12
Adding numbers in jagged columns, number problems		
• 2-4 addends, regrouping	B	
• 4-5 addends, regrouping	D	4, 5, 6, 7, 9
Adding numbers in jagged columns, word problems		
• 2-3 addends, regrouping	F	
• 4-5 addends, regrouping	H	5, 7, 8, 14
Additional Content Covered on Skill Sheets		
• comma placement		1, 2
• finding mistakes in addition problems		2
• budgeting skills		3
• pulling out facts from word problems		7, 15
• using large numbers in daily life		10
• estimating numbers		11, 12
• rounding off numbers		13
• numbers in the millions and billions		13
• sifting through too much information in word problems		14
• making up word problems		16

Content
Guinness World Records Problem Areas in Subtraction, Parts 1 and 2 (Mastery and Application Disks)

Skills	Mastery Disk Lesson	Skill Sheet
Subtraction number problems		
• numbers with up to 2 digits, no regrouping	A	1, 10, 11
• numbers with 3 or 4 digits, 1 or 2 regroupings	C	13, 15, 16
Subtraction word problems		
• numbers with 2 or 3 digits, no regrouping	E	9
• numbers with 2-4 digits, 1-3 regroupings	G	1, 4, 5, 6, 7, 8, 9, 14
Subtraction number problems with zero in the minuend		
• numbers with 3 or 4 digits, 1 or 2 regroupings, and up to 2 zeros in minuend	B	13, 16
• numbers with 5-9 digits, 2-5 regroupings, and up to 4 zeros in minuend	D	
Subtraction word problems with zero in the minuend		
• numbers with 3 or 4 digits, 1-3 regroupings, and 1-3 zeros in the minuend	F	3, 4, 6, 8, 9, 14
• numbers with 5-8 digits, 2-5 regroupings, and up to 5 zeros in the minuend	H	8
Additional Content Covered on Skill Sheets		
• using the inverse relationship between addition and subtraction		1
• checking subtraction problems		2
• recognizing "comparison" subtraction word problems		3, 4
• recognizing "before and after" subtraction word problems		5, 6, 10, 11
• recognizing "whole and part" subtraction word problems		7, 8, 9
• rounding numbers to the nearest 10		12
• estimating the answers to subtraction problems		13
• selecting number information from word problems		14
• working subtraction problems mentally		15

ADDITION LESSONS CONTENT SHEET (MASTERY DISK 20031)

In order to assign lessons on a class or on an individual basis, teachers should input the appropriate class code and class password. The password "teacher" sends the user to the management section. The password "student" sends the user to a lesson menu. In order to shape individual lessons, individual passwords must be assigned and stored on class files.

Initially, teachers are asked if they want to 1) allow menu selection or 2) set a starting level or 3) use class assignment. If the teacher chooses to set a starting level, these lesson shaping options are available:

Addition Problem Areas
1. Large Numbers 2. Jagged Columns Press 1 to 2?

Problem Types
1. Number Problems 2. Word Problems Press 1 to 2?

Problem Level
1. Less Difficult 2. More Difficult Press 1 to 2?

If you make these menu selections:	**You will assign this lesson:**	**The lesson will have these parameters:**
1. Large Numbers 1. Number Problems 1. Less Difficult	A	2 addends, no regrouping
2. Jagged Columns 1. Number Problems 1. Less Difficult	B	2-4 addends, regrouping
1. Large Numbers 1. Number Problems 2. More Difficult	C	2-3 addends, regrouping
2. Jagged Columns 1. Number Problems 2. More Difficult	D	4-5 addends, regrouping
1. Large Numbers 2. Word Problems 1. Less Difficult	E	2 addends, no regrouping
2. Jagged Columns 2. Word Problems 1. Less Difficult	F	2-3 addends, regrouping
1. Large Numbers 2. Word Problems 2. More Difficult	G	2-3 addends, regrouping
2. Jagged Columns 2. Word Problems 2. More Difficult	H	4-5 addends, regrouping

Lessons A-D offer number problems

Lessons E-H offer word problems

SUBTRACTION LESSONS CONTENT SHEET (MASTERY DISK 20033)

In order to assign lessons on a class or on an individual basis, teachers should input the appropriate class code and class password. The password "teacher" sends the user to the management section. The password "student" sends the user to a lesson menu. In order to shape individual lessons, individual passwords must be assigned and stored on class files.

Initially, teachers are asked if they want to 1) allow menu selection or 2) set a starting level or 3) use class assignment. If the teacher chooses to set a starting level, these lesson shaping options are available:

Subtraction Problem Areas
1. Regrouping 2. Zero in the Minuend Press 1 to 2?

Problem Types
1. Number Problems 2. Word Problems Press 1 to 2?

Problem Level
1. Less Difficult 2. More Difficult Press 1 to 2?

	If you make these menu selections:	**You will assign this lesson:**	**The lesson will have these parameters:**
Lessons A-D offer number problems	1. Regrouping 1. Number Problems 1. Less Difficult	A	2 digits, no regrouping
	2. Zero in the Minuend 1. Number Problems 1. Less Difficult	B	3 or 4 digits, 1 or 2 regroupings, 1 or 2 zeros in the minuend
	1. Regrouping 1. Number Problems 2. More Difficult	C	3 or 4 digits, 1 or 2 regroupings
	2. Zero in the Minuend 1. Number Problems 2. More Difficult	D	5 to 9 digits, 2 to 5 regroupings, up to 4 zeros in the minuend
Lessons E-H offer word problems	1. Regrouping 2. Word Problems 1. Less Difficult	E	2 or 3 digits, no regrouping
	2. Zero in the Minuend 2. Word Problems 1. Less Difficult	F	3 or 4 digits, 1 to 3 regroupings, 1 to 3 zeros in the minuend
	1. Regrouping 2. Word Problems 2. More Difficult	G	2 to 4 digits, 1 to 3 regroupings
	2. Zero in the Minuend 2. Word Problems 2. More Difficult	H	5 to 8 digits, 2 to 5 regroupings, 1 to 5 zeros in the minuend

OPERATING INSTRUCTIONS

PREVIEW INSTRUCTIONS

This is the simplest and most direct way to gain preview access to any of these disks:

1 Insert the disk in the disk drive (label up, notch to the left); turn on the computer and the monitor.
2 In response to the question "What is your name?" type in any name and press RETURN.
3 In a response to the question "What is your class code?" type in *a* and press RETURN.
4 In response to the question "What is your password?" type in TEACHER (Note: the computer will put up all Xs on the screen no matter what you type) and press RETURN.
5 When you see the menu, type in number *4* (for View the Lesson) and press RETURN.
6 You will then be presented with the Lesson Option screens; choose *1* or *2* (and press RETURN) according to which features you want.

After this, the computer will go directly into the lesson.

EQUIPMENT NEEDED

The *Guinness World Records Problem Areas in Math* program requires a 48K Apple II Plus Computer System with a 3.3 DOS or an Apple II Computer System with an Applesoft ROM card.

CAUTIONS

Disks should always be handled with extreme care to avoid erasing the information stored on them. The following precautions will minimize problems.

- Never touch the magnetic surface of the disk.
- Do not leave disks where they can collect dust. Always keep disks in disk jackets unless they are being used in disk drives.
- Never leave disks on top of television sets, disk drives, or other electronic equipment.
- Do not turn a disk system on or off with a disk in the drive. Magnetic fields generated by the drive's motor may alter the data on the disk.
- Do not press any keys when the red light on the disk drive is on. This means the disk is turning and the computer is searching for information.

Remember there may be valuable student records stored on the disk. Therefore it is important to learn the proper care and handling of them.

LOADING THE DISKS

With Autostart (on all 48K Apple II Plus or 48K with Applesoft Card):

1 Turn the microcomputer off. The power light on the *computer keyboard* indicates whether the power is on or off. The video display is *independent* of the Apple II itself.
2 Open the disk drive door and place the diskette in the disk drive by holding the diskette with your thumb on the label and placing it in the disk drive.
3 Close the disk drive door.
4 Turn the microcomputer and the TV or monitor on. The disk will load automatically and you will have the program on the screen. You will hear a humming sound as the diskette is loading, and the disk drive's red light will go on.
5 You are now ready to proceed with the program.

Otherwise (if you are not using a computer with Autostart):

1 Turn the microcomputer off. The power light on the *computer keyboard* indicates whether the power is on or off. The video display is *independent* of the Apple II itself.
2 Open the disk door and place the diskette in the disk drive by holding the diskette with your thumb on the label and placing it in the disk drive.
3 Close the disk drive door.
4 Turn the microcomputer and the TV or monitor on. On the screen or monitor screen you will see a double asterisk (* *) followed by a flashing square called a cursor. When you see this, push down on the control (CRTL) key. While holding it down, press letter B. You will see either a carat (>) or a bracket (]) and a flashing cursor.
5 Do you know in what slot number your disk drive interface card is installed? If not, then you will need to remove the cover of the Apple II to find out. All of the slots are numbered.
6 To lead the diskette's operating system (DOS) into the computer, type *PR#* followed by *the number of the slot* in which you have installed your disk drive card. For example, if the card is in slot #6, then you would type *PR#6*.
7 You are now ready to proceed with the program.

RUNNING THE PROGRAMS

All directions for running these programs are given as the student goes along. However, before starting it would be helpful to instruct the students as follows:

1 Do not press the RESET key by mistake. The RESET key wipes out the program that is running

and the student must begin again.

2 Pressing the SPACE BAR will advance the program to the next screen. The message "press SPACE BAR to go on" sometimes appears after a short delay. After pressing the SPACE BAR there is often a delay before the computer responds. This is a normal function. Do not hit the SPACE BAR again.

3 If a student wishes to leave the program in the middle, he or she should press the ESC key. The computer will then record the student's progress and branch the student to the menu or exit program.

MANAGEMENT SYSTEM

GENERAL INTRODUCTION

The SVE Management System will enable the teacher to tailor the computer program to the specific needs of an individual class and an individual student, and also update and store records of students' progress on the program.

SVE has designed this system for the greatest possible flexibility. Within a single class file, the teacher can set individualized lesson assignments for some students, route others to a generalized class assignment, and allow still others to shape their own lessons using a lesson menu. In all cases, the computer will record the number of times each student uses the program, the student's current lesson level, the number of problems he or she has attempted, and the number he or she has gotten correct. These cumulative records are available to the teacher at any time. The Management System combines this flexibility with "user-friendliness." Teacher inputs to the Management System are in the simplest forms possible, and are made in response to clear English questions; the Management System does the programming.

This section of the Teacher's Manual is divided into four parts. The first part presents the major options the teacher has for shaping the lesson to fit the needs of an individual student, and discusses the educational uses of these options. The second part is a comprehensive step-by-step guide to all the Management System's uses and functions (most of these are summarized for easy reference in the Management System Reference Sheets). The third part is a screen-by-screen guide to the major option screens of the Management System. The fourth part describes the special version of the Management System used on the Guinness Application disks (Programs 2 and 4).

Educational Uses

The Management System offers the teacher the opportunity to make crucial decisions that affect how the program runs. The teacher can thus "shape" the lesson that the students experience. This process of "lesson shaping" can be done on a general level, for an entire class; or, the teacher may vary the "lesson shaping" parameters for any individual student. In the event that the teacher does not want to get involved in the Lesson Shaping options, however, the programs are designed to run completely on "default" choices, without the need for teacher decisions.

What follows is a discussion of the main Lesson Shaping options, and how the teacher may make the best use of them.

Using the Lesson Sequence

The addition and subtraction problems in the *Guinness World Record Addition and Subtraction Mastery Disks* are presented in eight separate lessons. These lessons are stratified in order of increasing difficulty, according to the following scheme:

Addition Mastery Disk			LESSON
Number problems	Less difficult	Large Numbers	A
		Jagged Columns	B
	More difficult	Large Numbers	C
		Jagged Columns	D
Word problems	Less difficult	Large Numbers	E
		Jagged Columns	F
	More difficult	Large Numbers	G
		Jagged Columns	H

Subtraction Mastery Disk			
Number problems	Less difficult	Regrouping	A
		Zero in Minuend	B
	More difficult	Regrouping	C
		Zero in Minuend	D
Word problems	Less difficult	Regrouping	E
		Zero in Minuend	F
	More difficult	Regrouping	G
		Zero in Minuend	H

This stratification was worked out with the help of SVE's educational consultants, with problem difficulty as the main criterion. Word problems are considered, in general, more difficult to do than number problems; so all the number problems have been presented in the first four lessons, and all the word problems in the second four. Within each of these main divisions, the problems have been sorted into "Less difficult" and "More difficult" according to the number of regroupings and the number of digits or addends involved. The individual subskills alternate within these groupings.

In this system, the student develops his or her facility with the subskills, first with relatively simpler number problems and then with more difficult ones. After this, he or she combines these skills with practice in picking information out of word problems.

Depending on the teacher's educational objectives, he or she may not wish a student to follow the established sequence of lessons. (If, for instance, the teacher wants a student using the Addition disk to work exclusively on problems in Jagged Columns, he or she will want the student to proceed through lessons B-D-F-H instead of A-B-C-D-E-F-G-H.) In this case, once the student is finished with one level, the teacher can reassign the student to the next level desired, using the *Make an assignment* option of the Management System. (In the above example, once the student had completed Lesson B, the teacher would reassign that student to Lesson D instead of allowing the student to proceed with Lesson C.)

HI and LO Levels

The Management System allows the teacher to specify the number of problems a student must get correct in a row in order to advance a lesson, and also the number a student must get wrong in a row before he or she is set back one lesson lower. These limits can range from 1 to 20; they are called, respectively, the HI and LO limits.

The HI and LO limits can be effectively used to "shape" a lesson for the needs of the individual student. For instance, the sizes of these numbers will affect how long a student remains at any lesson. A HI limit of 3 means that the student only needs to get 3 consecutive correct answers to advance; he or she will thus progress through the levels rather rapidly. On the other hand, the student with a HI level of 15 or 20 will have to do many problems before he or she advances a lesson. In connection with this it is helpful to keep in mind how the lesson is programmed: the student will be given 5

problems, and then offered a chance at the game. (The student may then elect to take 5 more problems and another chance at the game.) This set of 5 problems and game may be defined as a single "session." Fourth, fifth, and sixth graders tested on these disks took an average of 15-25 minutes to complete one such "session."

Quite often, schools use microcomputer programs such as these to accommodate students who are progressing faster than average, or to give extra help to those who are falling behind. Manipulation of the HI and LO limits will allow the teacher to provide for both kinds of student. A large HI limit will slow down upward advancement, making the lesson more challenging for the "fast" student. On the other hand, a larger LO limit will allow more errors before the Management System assigns a lower lesson – an effective reinforcement for the "slow" student.

Record Sheets

This Teacher's Manual provides special record-keeping sheets for both teacher and student. The Class Records Sheet is coordinated with the Management System's Class Records screen, so that the teacher can copy records directly from the screen. The Student Progress Sheet is designed for use by the student to copy his or her own scores as he or she runs the program.

The Class Records Sheet can also serve as a master list of student passwords and lesson parameters. Student records can be copied down on these sheets periodically, as a check of each student's changes in level and also of each one's cumulative score.

The Student Progress Sheet can be used for more detailed monitoring of progress, since the student keeps separate records for each of his or her uses of the disk.

HOW TO USE THE MASTERY DISK MANAGEMENT SYSTEM

This second part of the Management System section gives the teacher instructions for various uses of the Management System, from the simplest to the most comprehensive. (The principal operations described here are also summarized in the separate *Management System Reference Sheets* for quick reference.) Following this, the third part of the Management System section reproduces the major option screens in the Management System *as they will appear in actual operation*, and discusses each option on each screen.

I. Getting into the Disk

First, insert the disk into your Apple 3.3 disk drive and boot normally. The screen will display the Guinness World Record disk title screen and (after a space bar prompt) the opening credits; then the computer will ask *What is your name*? Any first name can be used here (the computer stores this for use later in the program).

Next, the computer will ask *What is your class code*? The response to this should be a single letter designating a class file. Note that the prompt *Choose a to z* is followed by a flashing underline with the letter *a* above it. The underline is the cursor, indicating the space for input. The *a* that appears above it is the default value: if you press *RETURN* instead of any letter, the computer will use the *a* as the class code. Class *a* is a pre-established class file included in the basic Management System; it should always be selected unless new class files have been set up.

(NOTE: This screen also displays the message Press ESC to exit. Within the Management System, pressing ESC when this message appears will return the user to the previous option screen; pressing ESC during the program itself will route the user to the closing credits.)

The next screen asks *What is your password*? Class *a* as included in the Management System contains the class password TEACHER and the student password STUDENT. Typing the password TEACHER will give the user access to the Management System; typing STUDENT will take the user into the lesson itself. (To ensure confidentiality of the passwords, the computer is programmed to display a string of Xs no matter what password is typed. The "back-arrow" key can be used to correct typing mistakes.) After you have entered the appropriate password, press *RETURN*.

II. Bypassing the Management System

If you do not want to keep individual records of student progress, or shape lessons for individual students, you can use the disk without any further modifications. Simply instruct students to use the class code *a* and the password STUDENT. This will allow each student to set up his or her own lesson each time he or she runs the disk.

III. Using the Management System

After you select class code *a* and type in the password TEACHER, the computer will enter the Management System and display the main *Menu*. The options displayed here can be used to accomplish the following tasks:

Setting Up Class a

The Class *a* file is already set up with a class password (TEACHER) and the parameters for a general class assignment. If you plan to store records for only one class, you may find it easiest simply to add your student records to this file. To do this:

- Select the main *Menu's* option #3, *Assign for student*. The computer will then display the *Assign for student* option screen.
- From here, select #1, *Add a new student*, and begin to input your first student file.
  (NOTE: The other options on the main Menu and Assign for student option screens will be discussed systematically in the next section. For now, we will discuss only those options used to accomplish the specific task at hand.)
- After this selection, the computer will again ask for the class code; select *a* or just press RETURN.
- The computer will then ask *What is the new student password?* The student password can be up to seven characters long (numbers or letters). This password is what identifies the individual student's records when the class file is displayed. For easiest correlation with other class records, it may be best to assign each student a password consisting of the first five letters of the last name followed by the first two initials (e.g., "Mary R. Smith" becomes SMITHMR). On the other hand, each student may wish to invent his or her own "secret name" for use as a password. In either case, you should maintain on a separate sheet a roster of student names and their passwords. (The Class Records Sheet in this package was designed for this purpose.)
- After you have input a student password and pressed RETURN, the computer will display the *Lesson Shaping* option screen. Now you begin the process of assigning lesson parameters for the individual student's starting lesson.

  Using the general class assignment: At this point, instead of devising a new set of lesson parameters for the individual student, you may wish to set up the student record using option #3, *Use class assignment*. This will start the student with the general assignment for that class. If this option is chosen, the Management System will set up the new student record automatically and then display the Class Data screen so that you can check the new record. (From there you can ESCape to the main *Menu*.)
  (NOTE: The general assignment for a class is a part of the class file, and must be input when the class file is first established, using procedures described later. Class file a, as mentioned before, is already completely established with a general starting assignment. Thus, if you wish to use the record-keeping capacities of the Management System without going into the complexities of setting your own lesson parameters, the simplest solution is to input all your student records into class file a, and route each student to the built-in class assignment with the Use class assignment option.)

  Allowing the student to use the menu: Option #1 on the *Lesson Shaping* screen is *Allow menu selection*. If the student record is set up using this option, the student will be able to select a different starting level each time he or she runs the disk (the Management System will still record the number of times the student has run the disk, the number of problems tried, and the number correct). When this option is chosen, the computer can set up the student record with only two further teacher inputs.
  - First, the computer will ask *how many correct answers in a row will move the student to a higher level problem?* The number you input here is called the HI limit; it governs the student's progress to more difficult lessons. Type in the number (it is *not* necessary to precede a one-digit number with a zero here) and press RETURN.
  - You will then be asked to input the number of wrong answers that will move the student to a less difficult lesson (the LO limit). Again, type the number and press RETURN.

  With this information, the computer will set up the student record, and display it on the Class Data screen.

  Setting an individual starting level: Lesson Shaping option #2, *Set a starting level*, allows you to set up the student's record with its own individual starting level and lesson parameters.
  - When you select this option, you will be presented with a series of Lesson Menu option screens. By selecting from these options you build the student's starting assignment. The exact nature of these choices will vary from disk to disk (see the Content Correlation Chart and the Lesson Content Sheets earlier in the Teacher's Manual), but in all cases the Management System will use them to determine the student's starting lesson.
  - Next, the computer will ask you to set the HI and LO limits, as described above.

  When this is done, the Management System will set up the student record and display the Class Data screen.

Putting an Entire Class into Class File a

The three paragraphs above detail the ways to set up a single student file. Each of these procedures leaves you at the Class Data screen; from there you can return to the main *Menu*, elect *Assign for student* and then *Add a new student*, and repeat the process. Subsequent student records can be set up using any of the three *Lesson Shaping* options described above; thus, any student in a class can be given the general class assignment, routed to the Lesson Menu, or given an individualized starting assignment, according to the student's needs.

Viewing the Class Data

To display the records of all the students in a class:

- From the main *Menu* select option #1, *Review records*.
- Enter the appropriate class code when asked.

The layout of the Class Data screen is explained in the next section.

Changing Student Records

Password: To change a student password:

- Start from the main *Menu* and select *Assign for student*.
- From this option screen select *Change a password*.
- You will be asked for the class code, the old password, and the new password.

After you have input this information, the Management System will record the change and then display it on the Class Data screen.

Lesson assignment: To change the lesson parameters in an individual student record:

- Select the *Make an assignment* option from the *Assign for student* screen.
- You will be asked for the class code and the student password; then the Management System will display the *Lesson Shaping* option screen.
- From here, the procedure is the same as that for adding a new student; you can route the student to the general class assignment, give him or her access to the Lesson Menu, or set up new individual lesson parameters in the same manner as described above.

Deleting a student: You can erase a single student record from a class file by taking the following steps:

- Select *Delete a student* from the *Assign for student* option screen (#4).
- As prompted, input the class code and the student's password.
- After this, the Management System will ask *Are you sure you want to delete this password*? This question gives you a final opportunity to make sure that you are deleting the right student record. If you type *y* in response to this question, the student record will be erased, and that password will no longer allow access to the program. If you respond with *n*, the Management System will stop the deleting process and return you to the *Assign for student* screen.

Adding and Changing Class Files

SVE's Management System on Mastery disks can store approximately 90 students in one or more class files. Each class file has its own single-letter class code, class password, and general class assignment. Selecting *Assign for class* (option #2) from the main *Menu* allows you to manipulate the class files. Working from the *Assign for class* option screen, you can perform the following tasks:

Adding a class: To set up a new class file:

- Choose option #1 of the *Assign for class* screen, *Add a new class.*
- After you select this option, the Management System will ask for a new class code. This should be a single letter not already used with another class file.
- When you have input the new class code, you will be asked *What is the new class password*? (Like TEACHER in class file a, this password, of up to seven letters or numbers, will be the only one in the new class file that gives access to the Management System.) Type in the new password and press RETURN.
- The next step in setting up the class file is to input a general class assignment to which any or all of the students in the file can be deferred. Once you have input the new password, the computer will display another *Lesson Shaping* option screen. If you elect to *Allow menu selection*, any student deferred to the class assignment will be allowed to use the Lesson Menu (you set only the HI and LO limits); otherwise you can choose all starting parameters for this assignment by selecting *Set a starting level*.
- The procedure from here is the same as that for making an individual student assignment: you will make the choices for determining the starting level, and then set the HI and LO limits.
- After these parameters have been established, the Management System will ask one more question: *Do you want sound effects during the lessons and game*? An *n* response to this question will program the disk to run without sound

effects any time it is used by a student in this class file (useful if the disk will be used in one area of the classroom while a class is in session).

Changing the class password: The second option on the *Assign for class* option screen, *Change the password*, allows you to change the class password without changing the general class assignment.

- Select *Change the password* from the *Assign for class* screen.
- You will be asked to input the class code, the old class password, and the new class password.

Changing the class assignment: The procedure for changing a class file's general assignment is much the same as that for changing an individual student assignment.

- First, select the *Make an assignment* option from the *Assign for class* screen.
- Input the appropriate class code.
- You will then be sent to the class *Lesson Shaping* screen. You may choose at this point to *Allow menu selection*, and set just the HI and LO limits.
- If you elect to *Make an assignment*, you will go through the Lesson Menu to select starting-lesson options, set the HI and LO limits, and decide whether or not you wish to use sound effects.

Once this procedure is completed, the Management System will record the changes you have made and display the new class assignment on the Class Data screen.

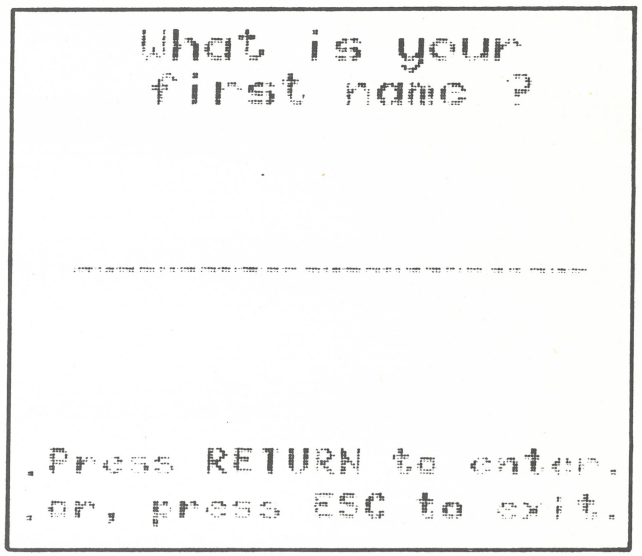
(NOTE: The lesson assignment in the general class assignment is a starting level only. The student whose individual record routes him or her to this assignment will start at that lesson; however, the Management System will note any lesson change he or she achieves while running the program, and start from that new level the next time that student runs the disk.)

Deleting a class file: Again, deleting a class file is much like deleting an individual student record.

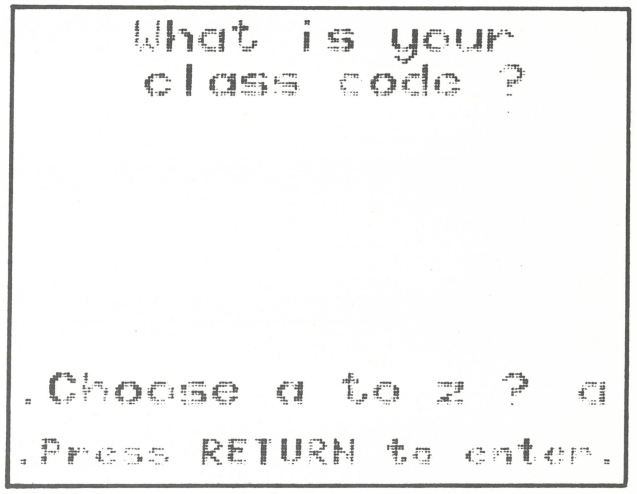
- On selecting *Delete the class* from the *Assign for class* option screen, you will be asked for the single-letter code of the class you wish to delete.
- The Management System then asks *Are you sure you want to delete this class code*? This is the last opportunity to check for a mistake before the class file is actually erased: a response of *n* to this question will abort the procedure and return you to the *Assign for class* option screen.

MASTERY DISK MANAGEMENT SYSTEM, SCREEN BY SCREEN

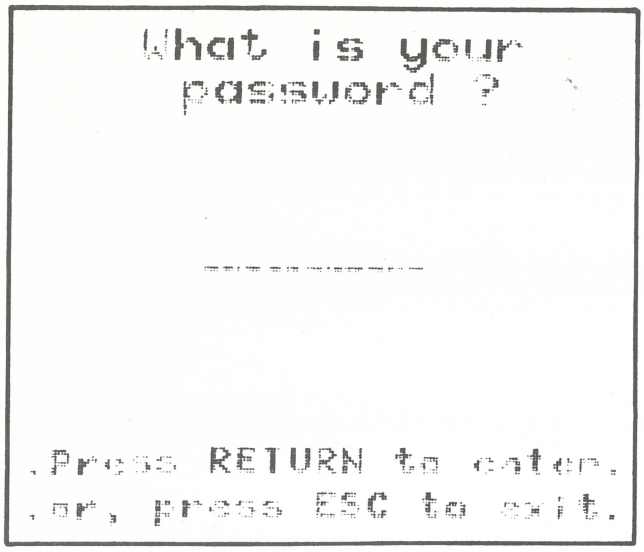
Introductory Screens



This screen will accept any name. The name typed in here is stored for use later in the program.

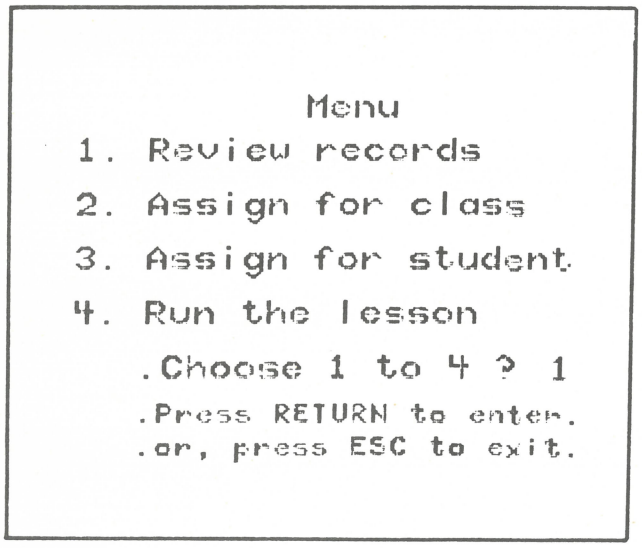


This screen accepts *only* a valid single-letter class code. Until the teacher adds other class files, the only valid class code is a.



This screen accepts *only* valid passwords. Until the teacher adds other student records, the only valid class password is TEACHER (in class file *a*); the only valid student password is STUDENT. (NOTE: for confidentiality, the computer prints Xs no matter what letters are typed.)

Main Option Screens



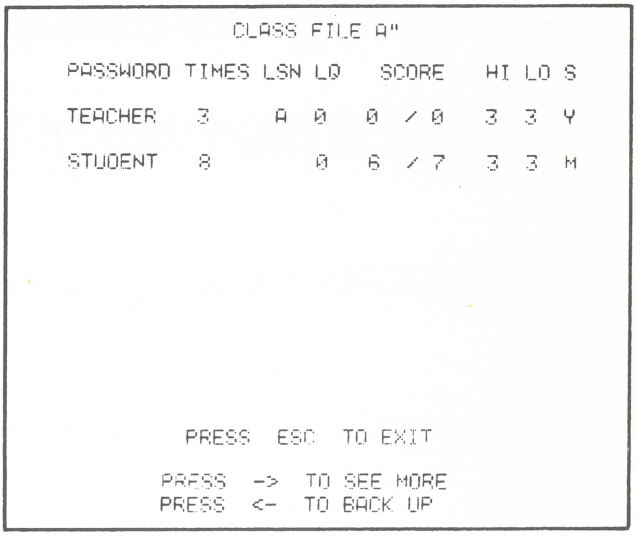
Main *Menu*

1 *Review records*—If you choose this option, the computer will ask for a valid class code; it will then display the student records for that class (see Class Data screen).

2 *Assign for class*—for adding a new class file, or changing or deleting the password or general assignment of an existing one. Goes to the *Assign for class* option screen.

3 *Assign for student*—for adding, deleting, or changing individual student records. Goes to the *Update student data* screen.

4 *Run the lesson*—asks for starting level information and *HI* and *LO* levels; then runs the program (returning to the Management System when the lesson is done).


CLASS FILE A"
PASSWORD TIMES LSN LQ SCORE HI LO S
TEACHER 3 A 0 0 / 0 3 3 Y
STUDENT 8 0 6 / 7 3 3 N
PRESS ESC TO EXIT
PRESS -> TO SEE MORE
PRESS <- TO BACK UP

Class Data Screen

The first line here contains the class password and the general class assignment information; subsequent lines are individual student records. The information on this screen is organized into columns headed as follows:

PASSWORD—student's or teacher's password.

TIMES—the number of times the student has used the disk.

LSN—the student's current lesson (in the first line, the general starting lesson).

LQ—the number of problems the student has completed in the current lesson.

SCORE—the number to the left of the slash is the number of problems the student has gotten correct on the first or second try; to the right of the slash is the total number of problems the student has completed.

HI—the number of problems the student must get correct in a row before he or she is branched to the next higher lesson.

LO—the number of problems the student has to get wrong in a row before he or she is branched to the next lower lesson.

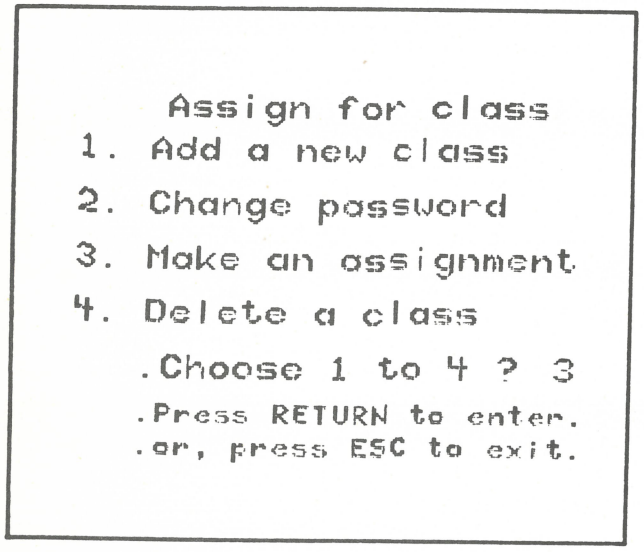
S—refers to the sound and *Lesson Shaping* options. A *y* or an *n* in the first (general class) line tells, respectively, whether the lessons for this class are conducted with or without sound. In the student records, this column will contain one of the following letters:

C—tells that the student will be routed to the general class assignment

I—tells that the student will be put on the individual assignment detailed in the same line

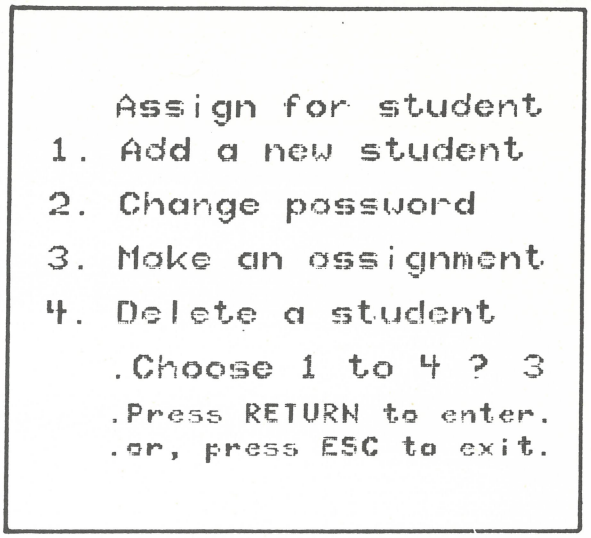
M–tells that the student has been given access to the lesson menu
F–tells that the student has gone past the last difficulty level and is now working directly from the menu

Pressing ESC from this screen will bring up the main *Menu*.


Assign for class
1. Add a new class
2. Change password
3. Make an assignment
4. Delete a class
.Choose 1 to 4 ? 3
.Press RETURN to enter.
.or, press ESC to exit.

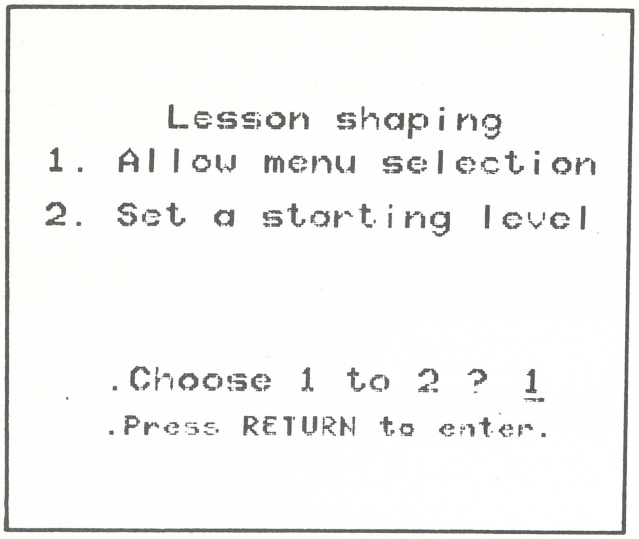
Assign for class Option Screen
Displays the following options:

1 *Add a new class*–sets up a new class file. Will ask for a new class code and class password, then goes to the class *Lesson Shaping* option screen.
2 *Change password*–changes the class password for an existing class file. Will ask for the valid class code, the old class password, and the new class password.
3 *Make an assignment*–changes the general class assignment for an existing class. Will ask for the valid class code, then go to the class *Lesson Shaping* option screen.
4 *Delete a class*–erases an entire existing class file. Will ask for the class code, and then ask one more time whether this class should be deleted before it proceeds.


Assign for student
1. Add a new student
2. Change password
3. Make an assignment
4. Delete a student
.Choose 1 to 4 ? 3
.Press RETURN to enter.
.or, press ESC to exit.

Assign for student Option Screen

1 *Add a new student*–adds a new student record, with a new password and lesson assignment, to an existing class file. Will ask first for the valid class code; will then ask for the new student password; will then go to the student *Lesson Shaping* option screen.
2 *Change password*–changes a current student's password. Will ask for the valid class code, the old student password, and the new student password.
3 *Make an assignment*–changes a current student's individual assignment. Asks for the valid class code and the student password, and then goes to the student *Lesson Shaping* option screen.
4 *Delete a student*–erases a current individual student's record. Asks for the valid class code and the student password; then asks one more time whether the student record should be deleted before proceeding.

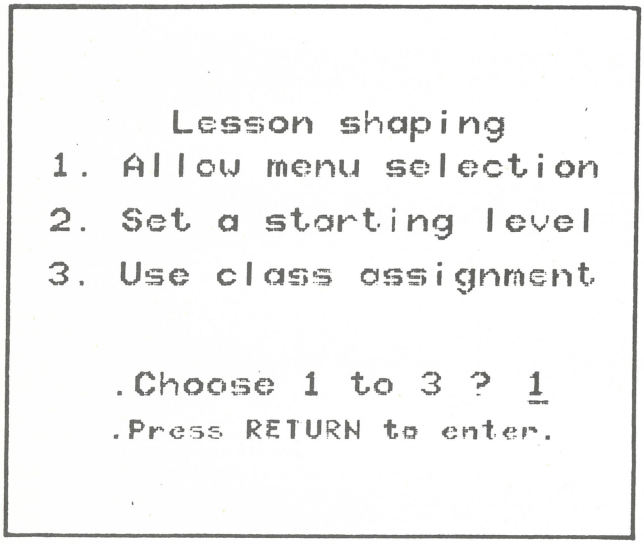


Class Lesson Shaping Option Screen

This screen presents the following options for setting up the general class assignment for a class file:

1 *Allow menu selection* – If this option is selected, any student in this class who is deferred to the general class assignment will be branched to the lesson menu. If selected, will ask teacher for *HI* and *LO* limits and a sound/no sound determination.

2 *Set a starting lesson* – If this option is selected, it allows the teacher to set specific parameters for the general class assignment. Goes through level-setting options; then asks for *HI* and *LO* limits and a sound/no sound determination.



Student Lesson Shaping Menu

This screen presents the following options for setting up an individual student record:

1 *Allow menu selection* – If this option is selected, the individual student will be routed directly to the lesson menu on entering his or her password. If selected, will ask teacher for *HI* and *LO* limits. Shows up as an "M" in the "S" column of the student's *Class Data* line.

2 *Set a starting lesson* – This option allows the teacher to set an individualized starting assignment for the student. Goes through level-setting options; then asks for *HI* and *LO* limits. An "I" in the "S" column of the student's *Class Data* line indicates that this individual assignment is in effect.

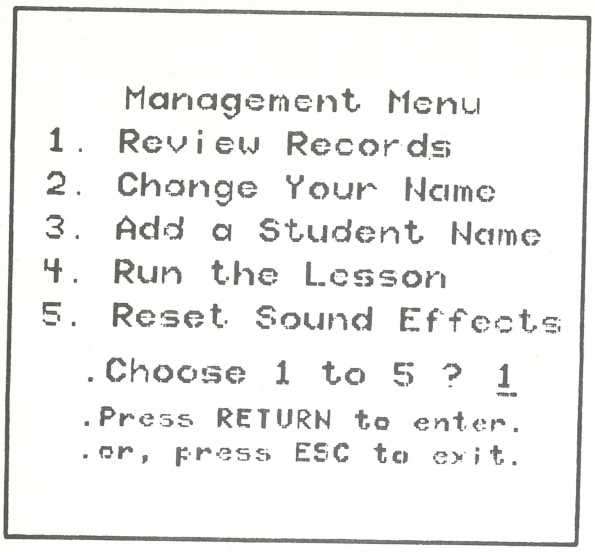
3 *Use class assignment* – If this option is chosen, the individual student will be routed to the general class assignment set through the *Update class data* option screen. A "C" in the student's "S" column on the *Class Data* screen indicates that this option is in effect for that student.

THE APPLICATION DISK MANAGEMENT SYSTEM

The second and fourth disks of the Guinness Math package – the Addition and Subtraction Application disks – are equipped with a special version of the Management System. This Management System keeps track of the student's place on the disk, in case he or she has to stop before going all the way through the program; it also gives the teacher the option of using the program with or without sound effects.

The Application Disk Management System stores up to 40 student records. Since the records stored here are not "performance" records but only place markers, this Management System does not use the confidential "password" system used on the mastery disks. Student records are stored and identified using the students' own names. The Management System creates its student records automatically; if there is no record already for the name typed in by the student, the Management System creates a new student record for that name. Then, if the student quits the program in the middle (using the ESC key) the Management System retrieves that student's current position and stores it in that student's record. When the student has gone all the way through the program, the Management System automatically erases that student record to make room for another.

The teacher gains access to the Management System by typing in a special password instead of the name. (The preset password is TEACHER.) In response to this, the Management System will display the following Management Menu:


Management Menu
1. Review Records
2. Change Your Name
3. Add a Student Name
4. Run the Lesson
5. Reset Sound Effects
.Choose 1 to 5 ? 1
.Press RETURN to enter.
.or, press ESC to exit.

These options can be used as follows:

1 *View the class list:* This displays the current list of names and the numbers that indicate the current positions. Pressing ESC from this screen will return the teacher to the Management Menu.

2 *Change your name:* This option allows the teacher to change the teacher password (the one that gives access to the Management System) to one of his or her own choosing.

3 *Add a student name:* Using this option, the teacher can put a new student name on the current list through the Management System.

4 *Run the lesson*: This option runs the program on the disk. When the program is finished, the computer will return to this option screen.

5 *Reset sound effects:* Using this option, the teacher can effectively turn the program's sound effects "on" or "off." This option can be used as often as desired in response to changing conditions.

PROGRAM SUMMARIES

PROGRAM 1
GUINNESS WORLD RECORDS PROBLEM AREAS IN ADDITION, PART 1 (MASTERY DISK) 20031

Objectives

- to teach and provide practice in two specific addition problem areas: adding large numbers and adding numbers in jagged columns
- to offer practice with number and word problems in these areas
- to use tutorials, drill and practice, and instructional gaming to challenge and motivate students

Menus

Initially, teachers are asked if they want to 1) allow menu selection, or 2) set a starting level, or 3) use class assignment. If the teacher chooses to allow menu selection, students will be shown the first two lesson shaping menus listed below. If the teacher chooses to set a starting level, he or she will be offered lesson shaping options from all three menus listed below.

Addition Problem Areas

1. Large Numbers
2. Jagged Columns

Problem Types

1. Number problems
2. Word problems

Problem Levels

1. Less difficult
2. More difficult

In regard to these options, there are eight possible combinations, or lessons available. These eight lessons are labeled A through H, and are sequenced according to difficulty. Lesson difficulty is measured by the need for regrouping and the number of addends. Please refer to the *Lesson Content Sheets* in this manual for specific math lesson parameters.

Summary

On this disk, students are challenged by the "Mathstermind" to do well on their lesson. Correct number problems are rewarded with related Guinness World Record facts. Word problems are built around interesting Guinness World Record statistics. Step-by-step examples are offered before each lesson. When inputing answers, students are told immediately whether they are right or wrong. After one error, they are told to try again. After two errors, a hint is provided. After three errors on any given problem, a full tutorial is offered. First, the column in which the error occurred is isolated and color-coded. Then, for problems involving regrouping, animated graphics and a verbal message walk the student through the problem, step-by-step. Students pace these steps by pressing the space bar. In addition to this comprehensive teaching approach, there is also a reward strategy built into the disk. Each time a student correctly answers a problem on one or two tries, he or she is rewarded with 50 or 30 points. He or she may also earn bonus points after each answer. At the end of

a lesson (five problems), students who answered at least three out of five problems correctly are asked if they want to play the "Mathsterblaster" game. If so, the points earned during the lesson convert to a span of time in which they may play the game. After the game, students may do more problems if desired.

PROGRAM 2
GUINNESS WORLD RECORDS PROBLEM AREAS IN ADDITION, PART 2 (APPLICATION DISK) 20032

Objectives

- to provide students with an opportunity to apply skills learned on the mastery disk
- to offer a reward for students able to demonstrate skills developed on the mastery disk
- to offer students the choice of adding large numbers, adding numbers in jagged columns, or word problems before each game

Menu

NOTE: It is recommended that students complete their work on the addition mastery disk before using this application disk. However, the disks don't necessarily have to be used in this order.

Teachers need not set up a class file for students to use this disk. A single class file (*a*) holding up to 40 names is provided on the disk. All names will be stored on this file.

To begin, a student simply puts in his or her name (not to exceed 9 characters). Or, he or she may use the "student" password. If a student must leave before completing the disk, the student may resume at the place he or she left off by simply inputing the name again. As soon as a student completes the disk, his or her name is automatically deleted from the class file. This will open up space for a new student, if needed.

Student Menu

Students will be shown a menu with these game choices listed:

1 Lucky Number
2 Grog Fight
3 Code Buster
4 Block It Head

Summary

Four Guinness World Record holders have been taken hostage by an evil crew of Space Grogs. Students are told that it is up to them to free the four record holders. In order to do this, they must beat the Grogs at four games; each time they win a game, a record holder is freed. But before students can play a game, they must do addition problems. So, at the outset of the disk, each student is asked to choose a path. The paths are labeled: 1) Adding Large Numbers, 2) Adding Numbers in Jagged Columns, and 3) Word Problems. Whatever path a student chooses will determine what kind of problems he or she will have to do before each game. For paths 1 and 2, the problems increase in difficulty with each successive game. For path 3 the problems are randomly generated. Hints and tutorials are available for all problems, but students are required to perform three problems perfectly before they are allowed to play the games.

Game 1. *Lucky Number*: This game of chance presents students with checkerboard squares numbered 0 through 9. One of the numbers (randomly placed), is designated as the "unlucky number." Students must select 5 numbers in row without hitting this "unlucky" number in order to win the game and to free the first Guinness World Record holder.

Game 2. *Grog Fight*: This hand-eye coordination game requires students to battle an army of lower Grogs within a specified time period. If successful, students must then beat the Head Grog in a "Showdown" in order to free the next record holder.

Game 3. *Code Buster*: This game challenges students to figure out a six-digit code within 20 guesses. Students are told immediately whether their guess is correct or not. If the guess is wrong, they are given a hint. If the hidden number is higher than their guess, an "H" appears. If the hidden number is lower than their guess, an "L" appears.

Game 4. *Block It Head*: This is a hand-eye coordination game which features a "blockhead" and four corridors entering into it through which white and violet blocks travel. The object is to shoot at the enemy blocks (violet) and keep them from entering the blockhead. At the same time, students must let the white blocks enter. At the end of the game, the friendly blocks inside the blockhead must outnumber the enemy blocks in order for the next record holder to be freed.

PROGRAM 3
GUINNESS WORLD RECORDS PROBLEM AREAS IN SUBTRACTION, PART 1 (MASTERY DISK) 20033

Objectives
The objectives of this disk are:
- to give students help and practice in two problem areas of subtraction: subtraction problems with regrouping and subtraction problems with zeros in the minuend
- to give students practice in solving number and word problems in these two areas
- to use tutorials, drill and practice, and instructional gaming to challenge and motivate students

Menus
The teacher can assign a lesson for the student (or, in some cases, the student can choose his or her own lesson) by choosing one alternative from each of the three following menus:

Subtraction Problem Areas

Subtraction
1. Regrouping
2. Zero in Minuend

Problem Types
1. Number problems
2. Word problems

Problem Levels
1. Less difficult
2. More difficult

Choices from these menus will place the student at one of the eight difficulty levels. Please refer to the Lesson content sheet in this manual for more specific information on lesson parameters.

Summary
On this disk, word and number problems in subtraction problem areas are introduced by King Minus, a somewhat sinister figure whose magical "Minus Touch" makes whatever he touches disappear. Students are rewarded for solving number problems with Guinness World Record facts, and also work word problems concerning Guinness World Records. A reward for the student who gets a problem completely correct on the first try is the spectacle of King Minus dispatching a dragon with his Minus Touch. If the student gets four out of five problems correct, he or she is rewarded with a game—a meeting with King Minus in his "Minus Maze." Here the student figure in the maze must run around and capture World Record treasures before the pursuing King Minus can make him or her disappear. The student may follow the game with more problems.

PROGRAM 4
GUINNESS WORLD RECORDS PROBLEM AREAS IN SUBTRACTION, PART 2 (APPLICATION DISK) 20034

Objectives
The objectives of this program are:
- to give students practice in solving word and number problems in two problem areas: subtraction with regrouping and subtraction with zeroes in the minuend
- to reward students who have demonstrated mastery of subtraction skills
- to involve students in situations which involve the use of their reasoning and decision-making skills

Menus
Since this activity disk presents the student with a single continuous narrative adventure, no lesson or section menus are used. Students are tested on a wide variety of subtraction skills. The Management System on this disk keeps track of the individual student's place in the narrative, in case the student is interrupted before the end.

Summary
This disk uses the format of an adventure simulation game. The student takes on the role of detective on the trail of a mastercrook named Subtracto. Subtracto has stolen the World's Largest Diamond, the Hope Diamond, and hidden it somewhere in his mysterious mansion. The student progresses from room to room searching for the diamond and the criminal. In each room the student has to make decisions which immediately affect the situation at hand; he or she also has to solve a variety of subtraction problems, which are found on hidden notes, inside blocks of ice, and in Subtracto's shooting gallery. After the diamond is found, the student plays a final strategy game against Subtracto; if the student wins, he or she keeps the diamond, while Subtracto lands in jail.

★GUINNESS WORLD RECORDS★

Class Records Sheet

Use with the disks: **Problem Areas in Math** (Mastery disks only)

Use this reproducible sheet to copy student records from the Class Data screen of the Management System.

_____ date _____ subject

_____ class _____ addition mastery disk

_____ subtraction mastery disk

password	name	times	lesson	last Q	score	Hi	Lo	S
					/			
					/			
					/			
					/			
					/			
					/			
					/			
					/			
					/			
					/			
					/			

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GUINNESS WORLD RECORDS PROBLEM AREAS IN MATH

STUDENT INFORMATION SHEET

ARE YOU READY to learn about the highest, fastest, longest, and best from the Guinness Book of World Records? Are you ready to practice addition watched by the mysterious Mathstermind, and challenge the evil Space Grogs? Are you ready to work on your subtraction with the sinister King Minus, and track the master crook Subtracto to his lair? If you are, WELCOME!

Please READ THESE INSTRUCTIONS CAREFULLY before you run the disk.

1 *Class Code and Password*: The first thing the computer will ask for will be your name. After that, depending on which disk you are using, the computer may also ask for a *class code* of one letter and a special *password*. Your teacher will give you these, if you need them. Remember your password, but keep it a secret! It is what the computer uses to recognize *you* when you run the program.

2 *Typing into the computer*: In these programs you will often have to type something in on the computer keyboard (such as your name, or a number). There are two keys you use in special ways when you do this:

RETURN key—Press this key after you have typed something in, to send what you have just typed into the computer. Remember this: use the *RETURN key* only when you see the words *Press Return to enter* on the screen.

Back arrow (←)—When you have to type something in, a flashing underline will show you where it will show up on the screen. If you make a mistake in typing, you can use the Back Arrow key to move the underline back under what you just typed. Then you will be able to type it over again before you press RETURN. You will also use this key along with the "front-arrow" key (→) during some of the games. The game rules will explain how.

(NOTE: These math programs often show you a math problem and ask you to type in the answer. Depending on the kind of problem, you may either have to type in the answer from right to left or from left to right. Usually it will be clear which direction you are typing. But sometimes, an arrow will appear on the screen next to the flashing underline, to show you what direction you will be typing in.)

3 Other special keys:
Space Bar—sometimes the computer will ask you to press the Space Bar when you are ready to go on to the next part of the program. Press the Space Bar only *once* for each screen.
Escape key (ESC)—This key allows you to "escape" from the program before the end. Whenever you see the words *Press ESC to exit* on the screen, you can use this key. The computer will record what you've done and send you to the very end of the program.

4 Keys you should *not* use:
Comma key (,)—When you are typing in large numbers, you do not need to put in commas. For instance: the large number 36,257 would be typed in without the comma after "6"—just plain 36257.
RESET key—If you press this key, it will stop the whole program, and you will not get credit for the problems you have done. So, watch out for this key! (It's easy to press RESET by mistake when you're reaching for the RETURN key.)

Ready to go? Follow these steps:
1 Get your class code and password from your teacher, if you do not know them already.
2 Put the disk in the disk drive, with the label facing up and the notch to the left.
3 Close the door on the disk drive.
4 Turn on the computer and the TV screen.
5 After the introduction, the computer will ask for your name. It may also ask for a class code and password, after that. Type in each of these when asked, and press RETURN after each one. (NOTE: When you type in your password, you will see that the computer prints "X" no matter which letter you type. This is done to make sure your password stays secret!)

After this, GET READY! For some amazing sights and sounds—for some good math practice—and for some astounding Guinness World Records!

★GUINNESS WORLD RECORDS★

Student Progress Sheet

Use with the disks: **Problem Areas in Math** (Mastery disks only)

Student: Use this sheet to keep track of your progress on the Guinness Math Mastery Disk.

Name _____

Class Code _____

Password _____

visit	date	Check one each visit: addition problem areas: large numbers	addition problem areas: jagged columns	subtraction problem areas: regrouping	subtraction problem areas: zero in the minuend	word or number problems	tries	correct
1								
2								
3								
4								
5								
6								
7								
8								

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SVE MANAGEMENT SYSTEM
REFERENCE SHEETS

The Management System is explained in complete detail elsewhere in the Teacher's Manual. These sheets have been provided for quick and easy reference. They contain a brief summary of important points, guides to the Lesson Menu and Class Data screens, and encapsulated instructions for using the major functions of the Management System.

Lesson Parameters

The Lesson Menu: Each Mastery disk contains eight "Lessons," each with its own set of addition or subtraction problems. The user can choose a specific lesson using the Lesson Menu, which consists of the three types of options shown below. The user makes one choice from each of the three screens. The Lesson Menu screens for the Addition and Subtraction Mastery disks read as follows:

Addition Mastery Disk

Addition Problem Areas
1. Large Numbers
2. Jagged Columns

Problem Types
1. Number problems
2. Word problems

Problem Levels
1. Less difficult
2. More difficult

Subtraction Mastery Disk

Subtraction Problem Areas
1. Regrouping
2. Zero in Minuend

Problem Types
1. Number problems
2. Word problems

Problem Levels
1. Less difficult
2. More difficult

The computer uses the choices made on these screens to assign one lesson out of the eight available (these are labeled "A" through "H").Lesson Menu choices and individual lessons correlate as follows:

Addition Menu Selections	**Lesson**	**Subtraction** Menu Selections
1. Large Numbers 1. Number problems 1. Less difficult	A	1. Regrouping 1. Number problems 1. Less difficult
2. Jagged Columns 1. Number problems 1. Less difficult	B	2. Zero in Minuend 1. Number problems 1. Less difficult
1. Large Numbers 1. Number problems 2. More difficult	C	1. Regrouping 1. Number problems 2. More difficult
2. Jagged Columns 1. Number problems 2. More difficult	D	2. Zero in Minuend 1. Number problems 2. More difficult
1. Large Numbers 2. Word problems 1. Less difficult	E	1. Regrouping 2. Word problems 1. Less difficult

2. Jagged Columns		2. Zero in Minuend
2. Word problems	F	2. Word problems
1. Less difficult		1. Less difficult
1. Large Numbers		1. Regrouping
2. Word problems	G	2. Word problems
2. More difficult		2. More difficult
2. Jagged Columns		2. Zero in Minuend
2. Word problems	H	2. Word problems
2. More difficult		2. More difficult

HI and LO limits: These are, respectively, the number of consecutive correct answers which will advance the student automatically to the next highest level, and the number of wrong answers in a row which will automatically move the student one level lower.

File and Record Setup

Class files: The Mastery Disk Management System can store approximately 90 student records in one or more class files. Each class file is identified by a single-letter class code, and contains a seven-character class password (the only password in the file that allows entry into the Management System) and a general class assignment, which can serve as a ready-made assignment for any student in that class file. The general assignment consists of a starting lesson and *HI* and *LO* limits.

Class file a: The Management System comes complete with a usable class file designated by the letter *a*. Class file *a* has a class password of TEACHER. Its class assignment is as follows: the starting lesson is *a*, and the *HI* and *LO* levels are both *3*. Class *a* contains one preset student record using the password STUDENT, which is set to route the user to the Lesson Menu, and uses *HI* and *LO* limits of 3.

Student records: Each student input into the Management System has his or her own record, which is keyed to a 7-character password (letters and/or numbers). The student record stores the information needed by the computer to set up the lesson, and also cumulative scores of the student's performance in the lessons.

Lesson Shaping: When setting up the student record, the teacher has three options: he or she may

1) allow the student to choose his or her own lesson via the Lesson Menu (here the teacher presets only the *HI* and *LO* limits);
2) preset both the starting lesson and *HI* and *LO* limits; or
3) give the student the general class assignment as his or her starting assignment

(NOTE: In the second and third options here, the teacher sets a *starting* lesson only. If the student moves to another lesson, the Management System will record and use that lesson change.)

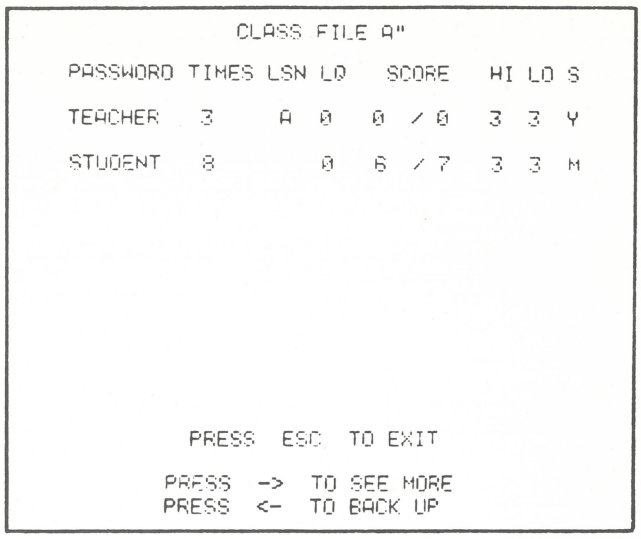
The Class Data Screen

The data screen for a particular class displays the record for each student in that class file, showing the student's current lesson, the number of problems he or she tried at that level, the total number of problems tried, and the number he or she has gotten correct. It also displays the class password and the general class assignment.

The Class Data screen is reproduced below, followed by a key to the column headings.

Class Data Screen

PASSWORD – class password and student passwords
TIMES – the number of times the student has used the disk
LSN – the student's current lesson (in the first line, the general starting lesson)
LQ – the number of problems the student has done at that level
SCORE – the number of problems the student has gotten correct/the number of problems tried
HI – the number of problems the student must get correct in a row before advancing to the next level
LO – the number of problems the student has to get wrong in a row before being routed to the next lower lesson


CLASS FILE A"
PASSWORD TIMES LSN LQ SCORE HI LO S
TEACHER 3 A 0 0 / 0 3 3 Y
STUDENT 8 0 6 / 7 3 3 M
PRESS ESC TO EXIT
PRESS -> TO SEE MORE
PRESS <- TO BACK UP

S – refers to the Sound and Lesson Shaping options. A Y or N in the first (general class) line tells, respectively, whether the lessons for this class are conducted with or without sound effects. In the student records, this column will contain one of the following letters:
C – tells that the student will be routed to the general class assignment
I – tells that the student will be put on the individual assignment detailed in the same line
M – tells that the student has been given access to the lesson menu
F – tells that the student has gone through the last lesson and is now working directly from the lesson menu

Using the Mastery Disk Management System

Getting into the Management System – After the opening credits, type any first name, then input class code *a* and the password *TEACHER* (or any other valid class code and corresponding class password). The screen will the display the Management System's main *Menu*.

Bypassing the Management System – If you do not wish to store or manipulate individual student records, tell students to use code *a* and the password *STUDENT* when running either of the Mastery disks. The use of this password will route students to the Lesson Menu screens, and then into the program.

Turning off the sound – From the main *Menu* select #2, *Assign for class*; from the next option screen select #3, *Make an assignment*. When asked for the class code, input *a* (or whatever other class code you may be working with). Then, from the *Lesson Shaping* menu, select #2, *Set a starting level*. Then, as prompted, you must reset the class assignment. (For class *a*, select option #1 from each of the three Lesson Menu screens; then set *HI* and *LO* levels of 3). After this, type in *n* in response to the question about sound effects. After this, whenever the lesson is started from a password in that class file, program will run without sound.

Adding a student – From the main *Menu*, select #3, *Assign for student*. From the next option screen select #1, *Add a new student*. Input the class code and a new student password. You will then be presented with the *Lesson Shaping* option screen. Option #2 here will allow you to set both the starting lesson level and the *HI* and *LO* limits for the student. Option #1 will allow the student to use the Lesson menu, but will still require you to set *HI* and *LO* levels. Option #3 will put the student on the general class assignment. After you have chosen from the *Lesson Shaping* menu, and selected other options as necessary, the Management System will set up the student record and display it on the Class Data screen.

Viewing class records – from the main *Menu*, select option #1, *Review records*. After you input a valid class code, the computer will display all the student records for that class.

Changing the teacher password – Select *Assign for class* from the main *Menu*, then *Change a password* from the next screen. The computer will ask for the class code, the old class password, and the new class password.

Changing a student password—Select *Assign for student* from the main *Menu*, then *Change a password* from the next option screen. The computer will ask for the class code, the old student password, and then the new password.

Adding a new class—From the main *Menu* select *Assign for class*. Then select *Add a new class* from the next screen. You must then input a new single-letter class code, then a new class password. After that, a general class assignment must be devised. The screen will display another *Lesson Shaping* option screen. If you choose #1 from this screen, *Allow menu selection*, any student routed to the class assignment will be allowed to select from the lesson menu; otherwise you can set a specific starting level through the second option. In either case, you will also have to set *HI* and *LO* limits and decide whether or not to use the sound effects. The computer will set up the new class file using this information.

Deleting a student—Select *Assign for student* from the main *Menu*; from the next option screen select #4, *Delete the student*. The computer will ask for the class code and the student password; after that, it will provide one more chance to stop before it erases the student record.

The Application Disk Management System

The two application disks included with this package also have a Management System, which will store the student's current position on the disk in case he or she is interrupted before running through the entire disk. All the student needs to do is type in his or her name when prompted; the Management System here will search for the name in its master file. If there is no record of that name in the file, the Management System will create one. The password TEACHER will give access to the internal functions of this Management System. From here, the teacher can add new student names, change the master password, or view the class list.

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GUINNESS WORLD RECORDS PROBLEM AREAS IN MATH
20030-SATC

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Place Value Review/Comma Placement

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Exercise 1

Look at the list of number categories in the box below. Then look at the numbers right below the box. Put the right letter beneath each number to show what number category it belongs in.

Example: 9,536
C

	Number in the
A	tens
B	hundreds
C	thousands
D	ten thousands
E	hundred thousands
F	millions
G	tens of millions

1 10,001 _____ 2 9,865,632 _____ 3 9,501 _____ 4 101 _____

5 65,889,009,857 _____ 6 976 _____ 7 637,089 _____

Exercise 2

Look at the numbers listed below. Each is missing at least one comma. Add the commas wherever they are needed in each number.

1 10005 4 8888118 7 669312054

2 97603 5 9908123 8 8351686

3 100771 6 1119 9 10034

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Place Value Review/Comma Placement

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Answer Key

Exercise 1

1 d

2 f

3 c

4 b

5 g

6 b

7 e

Exercise 2

1 10,005

2 97,603

3 100,771

4 8,888,118

5 9,908,123

6 1,119

7 669,312,054

8 8,351,686

9 10,034

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Finding Mistakes in Addition Problems

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Exercise 1

Look at the problems below. Each has some kind of error in it. Put a check in the box next to the problem which tells what is wrong with the problem.

1
```
  1,003,795
     33,661
    221,999
 +4,143,090
  5,402,545
```
☐ incorrectly added

☐ columns not lined up correctly

☐ comma in wrong place

2
```
    6,999
      753
        9
   11,343
 +  4,000
   2,3104
```
☐ incorrectly added

☐ columns not lined up correctly

☐ comma in wrong place

Exercise 2

Look at the four problems below. Check the addition in each. If the problem is correctly added, put a check in the box labeled *correct*. If the problem is incorrectly added, check the box labeled *incorrect*. Then, put the correct sum below the problem.

1
```
  1,066,331
     65,669
        768
+      6,008
  1,138,776
```
☐ correct

☐ incorrect

_____

2
```
      999
       78
      690
   +7,039
    8,906
```
☐ correct

☐ incorrect

_____

3
```
    654,990
     67,808
+   900,001
  1,622,799
```
☐ correct

☐ incorrect

_____

4
```
  1,440,987
 78,999,010
    769,987
+     4,666
 81,213,650
```
☐ correct

☐ incorrect

_____

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Finding Mistakes in Addition Problems

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Answer Key

Exercise 1:

1 columns not lined up correctly

2 comma in wrong place (23,104)

Exercise 2:

1 correct

2 incorrect (8,806)

3 correct

4 incorrect (81,214,650)

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Balancing the Budget/Adding Large Numbers

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Suppose you have $100.00 a month to spend on entertainment. Your list of entertainment items, however, will cost more than $100.00. So you will have to budget your money so that you can buy a few things each month. Look at the entertainment expenses listed below. List them in each month. Add up the total. Make sure each month's expenses are under $100.00.

Possible Expenses:

meals	$30.00
ball games	$15.75
arcade	$10.00
new skate-board	$75.00
new camping gear	$89.99
new tennis racket	$49.99
trip to computer camp	$99.00

item	March	cost

total for month

item	April	cost

total for month

item	May	cost

total for month

item	June	cost

total for month

20030

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Balancing the Budget/Adding Large Numbers 3

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Answer Key

Answers will vary.

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★GUINNESS WORLD RECORDS★

Connecting Facts and Numbers (Jagged Columns) 4

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Do the problems below. When you find the answers to each of the problems, circle the sum that you think best fits the item listed on the right. Then put that number in the blank on the right.

1
224
12
+ 5

2
98
501
+ 14

3
66
154
+200

Dusty, the world's most prolific cat, had a record _____ kittens.

4
8,431
17,003
+ 999

5
89
5,442
+77,777

6
27,000
401
+ 2,070

The highest priced hat cost _____.

7
33,500,000
12,000,000
+22,500,000

8
789,040
12,867,001
23,765,000
+ 66,060

The highest amount of money earned by an individual athlete was _____, earned by Muhammad Ali.

9
67,001
65,987
+ 4,002

10
175,090
175,900
+ 70,050

The greatest price ever paid for a used car, a 1936 Mercedes Benz, was _____.

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Connecting Facts and Numbers (Jagged Columns)

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Answer Key

1 241

2 613

3 420

4 26,433

5 83,308

6 29,471

7 68,000,000

8 37,487,101

9 136,990

10 421,040

420 $29,471 $68,000,000 $421,040

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An Expensive Trip/Adding Numbers in Jagged Columns 5

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Look at these world record expenses. Then read the story below. Choose an item from the list of expenses to fill in each of the blanks in the story. Be sure to add up the total amount spent.

List of Expenses

1 a pair of pandas worth $250,000

2 a killer whale worth $250,000

3 a cat worth $5,880

4 a turkey worth $4,400

5 a ruby costing $100,369

6 a pearl valued at $4,080,000

7 a topaz stone worth $1,066,350

8 a gold plate worth $122,000

9 a stuffed bird for $23,400

10 the London Bridge for $2,460,000

11 a chair for $85,000

12 a doll for $36,800

Yesterday, I was rich. But on the way to the bank, I got sidetracked. I saw _____ that I just had to buy! Then I stopped by the jewelry store. Whew! That was a mistake! I bought _____ and _____. Then I stopped into an antique store. Another mistake! I bought _____ for my best friend. By the time I reached the bank, I had lots of nice things but no more money! So I turned around and went home!

_____

_____

_____

_____

+ _____

Total spent

20030

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An Expensive Trip/Adding Numbers in Jagged Columns 5

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Answer Key

Answers will vary.

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Adding Up the Clues

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Her name was "Princess Te Kawau," and she holds a world's record no person will ever beat. See if you can guess what she was famous for.

Do the problems below. When you find the sum, look for that number in the squares above the problem. Black out the squares and you'll find a letter clue. When you see all four letters, you'll know what she was famous for!

			5	5
	7	9	5	3
8	4	2	1	0
	0	7	7	9
			7	6
0	9	3	1	0

751
82
+ 9

				1
	6	7	6	0
	0	8	9	0
	3	3		3
				1
0	3	7	9	9

8
12
13
55
+ 1

0	8	3	9	9
8				7
3	1	0	0	9
0	1			7
0	9	9		9
2				1

50,591
13,412
+18,999

6				
7		6	4	5
7				9
2	0	0	5	1
1				2
8	8	5	0	0

420
391
+101

20030

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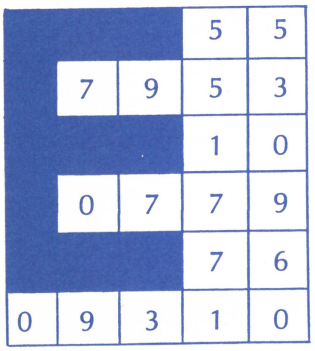
Adding Up the Clues

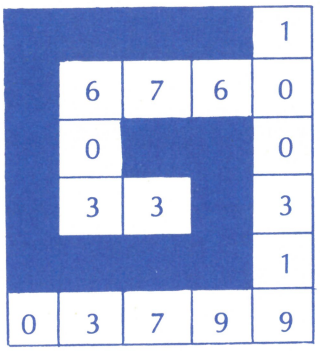
Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Answer Key

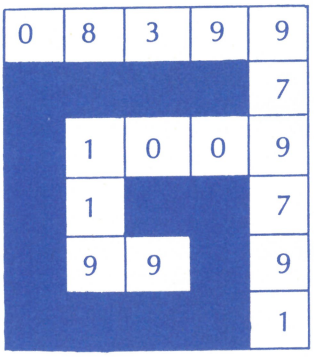
"Princess Te Kawau" was a record setting hen who laid 361 eggs in 364 days back in 1931.



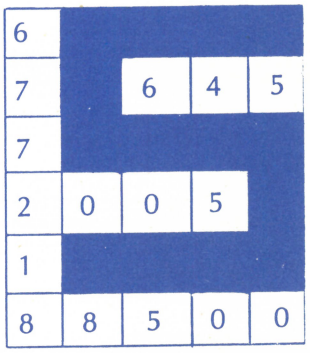
751
82
+ 9
842



8
12
13
55
+ 1
89



50,591
13,412
+18,999
83,002



420
391
+101
912

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Word Problems Sports Quiz

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Look at the football passing records listed below. These are all world record statistics. After you've looked them over, answer the questions about them below.

Football Passing Records

Most Seasons Leading League –
6 Sammy Baugh, Washington
1937, 1940, 1943, 1945,
1947, 1949

Most Passes Attempted, Lifetime –
6,467 Fran Tarkenton, Minnesota
(3,686 completions)

Most Passes Attempted, Season –
589 Dan Fouts, San Diego 1980
(348 completions)

Most Passes Attempted, Game –
68 George Blanda, Houston 1968
(37 completions)

Most Passes Completed, Lifetime –
3,686 Fran Tarkenton, Minnesota
(6,467 attempts)

Most Passes Completed, Season –
348 Dan Fouts, San Diego 1980
(589 attempts)

1 Put a line under each of the years in which Sammy Baugh of Washington led the league in passing.

1937	1939	1940	1942
1943	1945	1947	1949

2 Add the number of passes completed, lifetime, by Fran Tarkenton to the number of passes completed by Dan Fouts in the 1980 season.

_____ completed by Fran Tarkenton
_____ completed by Dan Fouts
_____ Total

3 Find George Blanda's record for most passes attempted in one game. Add this figure to Fran Tarkenton's record for most passes attempted, lifetime. How many pass attempts does this make in all?

_____ attempted by George Blanda
_____ attempted by Fran Tarkenton
_____ Total

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Word Problems Sports Quiz

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Answer Key

1 1937 1940 1943 1945 1947 1949

2
$$\begin{array}{r} 3{,}686 \\ +\ 348 \\ \hline 4{,}034 \end{array}$$

3
$$\begin{array}{r} 68 \\ +6{,}467 \\ \hline 6{,}535 \end{array}$$

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Auction Addition

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Imagine you are a rich art lover. You are going to an auction to buy some of the world's greatest paintings. You have $3,000,000.00 to spend.

Select the works you would buy from the list below. Add up the total spent (it must be below $3,000,000.00) and check off the paintings you bought on the list.

Highest Priced Paintings – Progressive Records (Partial Listing)

	Price	*Painter, Title*
_____	$32,500	Antonio Correggio's *The Magdalen Reading*
_____	$42,500	Raphael's *The Sistine Madonna*
_____	$80,000	Van Eyck's *Adoration of the Lamb*
_____	$123,000	Murillo's *The Immaculate Conception*
_____	$350,000	Raphael's *Ansidei Madonna*
_____	$500,000	Raphael's *The Colonna Altarpiece*
_____	$514,400	Van Dyck's *Elena Grimaldi-Cattaneo*
_____	$514,400	Rembrandt's *The Mill*
_____	$582,500	Raphael's smaller *Panshanger Madonna*
_____	$1,572,000	Leonardo da Vinci's *Benois Madonna*

_____

_____

_____

_____

_____

_____ *total spent*

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Auction Addition

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Answers Key

Answers will vary.

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World Record Addition

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Do the addition problems listed below. After you find the correct sum, look at the statements listed beside the problem. The sum will relate to one of the statements. Circle *A, B,* or *C* to show which statement you think fits the sum.

1
```
  5,675
  5,543
+ 5,822
```

A number of hours of television watched by average American child by age 18

B number of words in longest sentence ever

C highest price ever paid for a book

2
```
  200,000
  150,000
+ 250,000
```

A average yearly salary of Johnny Carson

B age in years for oldest living thing

C estimated number of people in attendance at largest rock festival ever

3
```
  153,953
+  96,047
```

A amount paid to Brooke Shields for one commercial

B number of copies of *Saturday Night Fever* album sold

C amount earned by ABBA, the world's most successful pop group

4
```
    695
  1,280
+     2
```

A number of kids in world's largest family

B year in which the first test-tube baby was born

C amount paid for world's most expensive pair of shoes

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World Record Addition

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Answer Key

1 17,040 A

2 600,000 C

3 250,000 A

4 1977 B

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Using Your Addition Skills

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Take this sheet with you for a day. See how many ways people use or add large numbers or numbers in jagged columns. List one way people do this in each box below.

at home
(address, etc.)

at the store
(receipt, etc.)

at school
(student I.D. #, etc.)

at the bank
(account #, etc.)

at the library
(Dewey Decimal #, etc.)

at the arcade
(different point totals, etc.)

other
(in the newspaper, etc.)

other
(counting change, etc.)

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Using Your Addition Skills

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Answer Key

Answers will vary.

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Addition Mission/Estimating Numbers

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Imagine it is 20 years ago. An evil plot is about to unfold. The world's heaviest twins, Billy and Benny McCrary, are about to go a whole night without a meal! You've got to save them! There are four steps you must follow to do this.

1 get the combination to the safe

2 count out $512.00

3 get the phone number to the pizza parlor

4 order 100 pizzas

Do these problems until you find the sum that matches the number on the left. Then move on to the next step.

combination 5673	500 17 1798 + 44	3112 444 9001 + 17	2000 3000 322 + 351
money $512.00	$33.00 17.50 .49 + 5.90	$211.00 200.00 + 101.00	$211.50 112.50 + 56.00
pizza parlor phone number 697-7000	120,000 56,000 898,000 + 76,050	543,800 33,000 12,000 + 200	655,000 33,000 + 9,000
100 pizzas	12 9 76 + 9	12 13 56 +18	63 7 17 +13

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Addition Mission/Estimating Numbers

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Answer Key

combination 5673	500 17 1798 + 44 2,359	3112 444 9001 + 17 12,574	2000 3000 322 + 351 5,673
money $512.00	$33.00 17.50 .49 + 5.90 $56.89	$211.00 200.00 + 101.00 $512.00	$211.50 112.50 + 56.00 $380.00
pizza parlor phone number 697-7000	120,000 56,000 898,000 + 76,050 1,150,050	543,800 33,000 12,000 + 200 589,000	6,550,000 33,000 + 9,000 6,970,000
100 pizzas	12 9 76 + 9 106	12 13 56 +18 99	63 7 17 +13 100

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Estimating Numbers

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Here's a chance to use your estimating skills and take a gamble at the same time.

Look at the problems below. Below each problem are three sums, only one of which is the answer to the problem above.

Your job is to guess or *estimate* which sum fits the problem without actually doing the problem on paper. Of the three sums given for each question circle the one you think fits the problem. Then see how many you guessed correctly. If you guessed 4 or more correctly, you can pretend you've won $355,000.00! That's how much Lawrence "Chuck" Balantine won in the biggest slot machine payoff in history!

1
$$\begin{array}{r} 3{,}000 \\ 3{,}000 \\ +\,4{,}500 \\ \hline \end{array}$$

20,000
10,500
30,000

2
$$\begin{array}{r} 10{,}000 \\ 15{,}100 \\ +\,20{,}900 \\ \hline \end{array}$$

86,000
95,000
46,000

3
$$\begin{array}{r} 50{,}000 \\ 50{,}500 \\ +\,49{,}000 \\ \hline \end{array}$$

149,500
249,500
349,500

4
$$\begin{array}{r} 100{,}000 \\ 400{,}000 \\ +\,600{,}000 \\ \hline \end{array}$$

2,100,000
3,100,000
1,100,000

5
$$\begin{array}{r} 102 \\ 107 \\ 109 \\ +\,111 \\ \hline \end{array}$$

429
829
929

6
$$\begin{array}{r} 501 \\ 511 \\ 509 \\ +\,500 \\ \hline \end{array}$$

4,051
8,021
2,021

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Estimating Numbers

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Answer Key

1 10,500

2 46,000

3 149,500

4 1,100,000

5 429

6 2,021

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Rounding Off/Numbers in the Millions and Billions

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Rounding off a number means you must find the nearest multiples. 10, 100, and 1000 are typical multiples. First find the two closest multiples of 10, 100, or 1000 for a number. Then round the number up or down to the nearest multiple. A number that ends in 5 is always rounded to the higher 10.

Examples: 1175 rounded to the nearest 10 is 1180
1175 rounded to the nearest 100 is 1200
1175 rounded to the nearest 1000 is 1000

Exercise 1: Round these numbers off.

1 12,759
_____ to the nearest ten thousand

2 105,051
_____ to the nearest hundred

3 79
_____ to the nearest ten

4 1,007,567
_____ to the nearest hundred thousand

5 235,989
_____ to the nearest thousand

6 1,007,531
_____ to the nearest hundred

Exercise 2: Put an *M* under the numbers listed below which are in the millions. Put a *B* under the numbers in the billions.

1 11,569,001 _____

2 10,874,900,313 _____

3 110,006,522 _____

4 8,009,675 _____

5 999,090,999 _____

6 3,012,765,365 _____

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Rounding Off/Numbers in the Millions and Billions

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Answer Key

Exercise 1:

1 10,000

2 105,100

3 80

4 1,000,000

5 236,000

6 1,007,500

Exercise 2:

1 M

2 B

3 M

4 M

5 M

6 B

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Word Problems with Too Much Information

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Sometimes word problems give you more information than you need. Look at the facts and numbers in the word problems below. Underline *only* the facts and numbers you need to know in order to do the problem. Then, do the addition problem below each paragraph.

Example: The largest living primates are the gorillas in Zaire and Uganda. They weigh about 360 pounds each. The smallest antelopes weigh about 8 pounds, and the smallest deer weigh about 17 pounds. The heaviest horse weighed 3,200 pounds. How many pounds do the heaviest primate and the heaviest horse weigh together?

```
   360
+3,200
 3,560 pounds
```

1 The oldest horse, Old Billy, lived 62 years. The oldest snake, Popeye, lived about 40 years. The oldest goldfish, Fred, lived 41 years. How many years did Old Billy and Popeye live, between them?

```
  62
+40
```

2 The longest dairy has 15,000,000 words in it. The longest letter had 1,113,747 words. One author has an output of 100,000,000 words. How many words would you have if you added the number of words in the dairy and the letter?

```
  15,000,000
+  1,113,747
```


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Word Problems with Too Much Information

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Answer Key

1 The oldest horse, Old Billy, lived 62 years. The oldest snake, Popeye, lived about 40 years. The oldest goldfish, Fred, lived 41 years. How many years did Old Billy and Popeye have between them?

$$\begin{array}{r} 62 \\ +\ 40 \\ \hline 102 \end{array}$$

2 The longest diary has 15,000,000 words in it. The longest letter had 1,113,747 words. One author has an output of 100,000,000 words. How many words would you have if you added the number of words in the diary and the letter?

$$\begin{array}{r} 15{,}000{,}000 \\ +\ 1{,}113{,}747 \\ \hline 16{,}113{,}747 \end{array}$$

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Pulling Out Facts from Word Problems

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Read the paragraphs below. Then, look at the statements made about the paragraphs. Circle *T* if the statement is true, or *F* if the statement is false.

Longest Runs

The longest continuous run of any show is of *The Mousetrap* by Agatha Christie. The 11,500th performance of this show took place in London on July 22, 1980.

A melodrama, *Gold in the Hills*, has been presented by the Vicksburg Theatre Guild of Vicksburg, Mississippi, every season since 1936. Frances Etheridge played in it the whole 45 years.

The greatest number of performances of any theatrical presentation is 39,046 (to Sept. 30, 1980) in the case of *The Golden Horseshoe Revue*—a show staged at Disneyland Park, Anaheim, Calif.

The long-run record for any Broadway show was set on Dec. 8, 1979, when *Grease* was performed for the 3,243rd time.

The off-Broadway musical show *The Fantasticks* by Tom Jones and Harvey Schmidt achieved its 8,736th performance on May 3rd, 1981. It has been played in a record 4,000 productions in 55 countries.

1 The longest continuous run of any show is held by *Gold in the Hills*. (T or F)

2 Frances Etheridge played in the melodrama *Gold in the Hills* for 45 years. (T or F)

3 The greatest number of performances for any theatrical presentation is 39,546. (T or F)

4 The long-run record for a Broadway show is held by *Grease*. (T or F)

5 The off-Broadway musical show, *The Fantasticks*, is by Tom Jones and Harvey Schmidt. (T or F)

6 *The Fantasticks* has been played in a record 4,000 productions. (T or F)

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Pulling Out Facts from Word Problems

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Answer Key

1 F

2 T

3 F (39,046)

4 T

5 T

6 T

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Making Up Your Own Word Problems

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Here's a way to practice making up your own word problems.

The next time you use one of the Guinness Book of World Records microcomputer disks, choose any 4 Guinness facts given during the lesson. Copy the facts down on this sheet. Then make up your own addition word problems by using the facts in a different way than they are used on the disk. Try them on a friend.

Word Problem 1:

Word Problem 2:

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Making Up Your Own Word Problems

Use with the disks: **Problem Areas in Addition** (Mastery and Application)

Answer Key

Answers will vary.

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Subtraction ABC's

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

If we know the sum of two numbers, we can be sure that the sum *minus* one of the numbers will give us the other number.
For example:

Since 5 + 7 = 12 we know that 12 − 7 = 5 *and* 12 − 5 = 7

Any addition fact will give us a set of 3 numbers like this:

If a + b = c, we know that c − b = a *and* c − a = b

If we have 2 of these numbers we can always find the third, no matter how the numbers are rearranged. It's as easy as a, b, c!

Complete the table at left. Use it to answer the questions on the right.

a	+	b	=	c
6				15
4		5		
		2		17
16				24
8		5		
1		4		
		7		14
13				20
14		5		
		11		23

1 What number must be added to 16 to get 24? _____

2 What is 15 − 9? _____

3 What number subtracted from 14 leaves the same number? _____

4 How much less than 20 is 13? _____

5 19 is 5 plus what number? _____

6 What number is 4 more than 5? _____

7 What is left after you take 15 from 17?
_____

8 How much more is 23 than 11?
_____

9 What number must be subtracted from 13 to get 8? _____

10 What is the difference between 5 and 4?
_____

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Subtraction ABC's

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

Answer Key

The completed table:

a	+	b	=	c
6		9		15
4		5		9
15		2		17
16		8		24
8		5		13
1		4		5
7		7		14
13		7		20
14		5		19
12		11		23

The Questions:

1 8

2 6

3 7

4 7

5 14

6 9

7 2

8 12

9 5

10 1

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Checking Subtraction

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

Once you solve a subtraction problem, you can "unsolve" it by using addition. For example: if you start with 12 and subtract 5, you get

$12 - 5 = 7$

"Solving" the problem leaves you with 7. To "unsolve" it, *add* the 5 back again:

$7 + 5 = 12$

You come out where you started, with 12!
"Un-solving" a subtraction problem is a good way to check and see if you subtracted right. Here's how. When you've finished a subtraction problem, like

$$\begin{array}{r} 53 \\ -\ 26 \\ \hline 27 \end{array}$$

draw another line under your answer:

$$\begin{array}{r} 53 \\ -\ 26 \\ \hline 27 \\ \hline \end{array}$$

Now *add* the answer (27) to the number being subtracted (26). Do these numbers add up to the number subtracted from at the very top?

If they do, you've done the problem right. If not, better check your subtraction!

Check these subtraction problems using the method talked about above. If the answer is wrong, cross it out and write the correct answer beside it.

1 $\begin{array}{r} 33 \\ -\ 17 \\ \hline 14 \end{array}$ 2 $\begin{array}{r} 40 \\ -\ 22 \\ \hline 18 \end{array}$ 3 $\begin{array}{r} 21 \\ -\ 5 \\ \hline 16 \end{array}$ 4 $\begin{array}{r} 52 \\ -\ 20 \\ \hline 42 \end{array}$

5 $\begin{array}{r} 25 \\ -\ 9 \\ \hline 17 \end{array}$ 6 $\begin{array}{r} 36 \\ -\ 21 \\ \hline 15 \end{array}$ 7 $\begin{array}{r} 41 \\ -\ 19 \\ \hline 22 \end{array}$ 8 $\begin{array}{r} 58 \\ -\ 24 \\ \hline 35 \end{array}$

9 $\begin{array}{r} 19 \\ -\ 13 \\ \hline 6 \end{array}$ 10 $\begin{array}{r} 45 \\ -\ 38 \\ \hline 7 \end{array}$ 11 $\begin{array}{r} 28 \\ -\ 15 \\ \hline 14 \end{array}$ 12 $\begin{array}{r} 91 \\ -\ 60 \\ \hline 31 \end{array}$

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Checking Subtraction

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

Answer Key

1 Wrong—answer is 16

2 Correct

3 Correct

4 Wrong—answer is 32

5 Wrong—answer is 16

6 Correct

7 Correct

8 Wrong—answer is 34

9 Correct

10 Correct

11 Wrong—answer is 13

12 Correct

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Subtraction Word Problems #1

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

Sometimes a subtraction word problem will give you 2 numbers (weights, lengths, or ages, for example) and ask you to compare them. The answer to the problem will be the difference between the two numbers.

For example:

1 The world's fastest flying insect, the deer bot-fly, flies at 24 miles per hour (mph). The world's fastest moving land snake, the slender black mamba, moves at 7 mph. How much faster is the fly than the snake?

In this problem, what is the greater speed? ( )mph

What is the lesser speed? – ( )

What is the difference between them? ( )

Try two more "comparison" problems.

2 The fastest anyone ever walked on snowshoes was about 1 mph. Richard Lemay did this. M. Garisoain walked faster than anyone ever on stilts. He went 7 mph. What is the difference between these two speed records?

( )mph
– ( )
( )mph

3 A writer named Kathleen Lindsay had a record 904 works published. She died in 1973. Only a novelist living today, Lauran Paine, has published 834 works. How many more works did Kathleen Lindsay publish?

( )works
– ( )
( )

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Subtraction Word Problems #1

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

Answer Key

1 Example problem:

$$\begin{array}{r} 24 \\ -\ 7 \\ \hline 17 \end{array}$$

2 Second problem:

$$\begin{array}{r} 7 \\ -\ 1 \\ \hline 6 \end{array}$$

3 Third problem:

$$\begin{array}{r} 904 \\ -\ 834 \\ \hline 70 \end{array}$$

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Subtraction Word Problems #2

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

Now you can make up your own "comparison" word problems! Use the Guinness World Speed records from the table. Fill in the blanks in the form below. There you are!

Solve these problems yourself on a separate piece of paper, then try them on a friend!

The Fastest . . .	The Record (and Record Holder)
Land Animal	63 mph (Cheetah)
Bicycle Rider	59 mph (Dave Grylls)
Airliner	1,450 mph (Concorde)
Submarine	84 mph (Russian Alfa-class)
Hovercraft	104 mph U.S. Navy SES-10008)
Baseball Pitch	101 mph (Nolan Ryan)
On a Skateboard	72 mph (Richard K. Brown)
On Skis	124 mph (Steve McKinney)
Ping-Pong Ball	106 mph
Running Backward	16 mph (Paul Wilson)

First, fill in the blanks.

The world's fastest _____ is _____, traveling at _____ mph. _____, the world's fastest _____, goes at _____ mph. Which would win if the two had a race? How much faster would the winner go?

Answer: _____ _____

Now, write your own!

First record _____

_____

_____

Second record _____

_____

_____

The question _____

_____

_____

Answer: _____ _____

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Subtraction Word Problems #2

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

Answer Key

Answers will vary.

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Subtraction Word Problems #3

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

Some subtraction word problems are "before-and-after" problems. This kind of word problem talks about a value or measurement that grows larger or smaller, so that the problem involves both a "before" and an "after" number.

Sometimes the problem will give you both of these numbers and ask you to compare them. Or the problem will tell you only the "before" value, and then give you information about how much its value changed. You will then have to find the "after" number by subtracting the amount of change from the "before" value.

For example:

The world's largest movie theater, the Radio City Music Hall, opened with 5,945 seats. Later, 63 of these seats were taken out. How many seats were left after that?

How many seats did the theater have "before"? ( )

How many seats were taken away? – ( )

How many seats remained "after"? ( )

Other "before-and-after" problems are about a value or measurement that has *increased*. These problems will give you the "after" value and then give you information about how much of an increase resulted in that value. You will have to find the "before" number.

For example:

In 1931, Adam Rainer was 85 inches tall. He got this tall by growing a record 39 inches in 11 years! How tall was he before this 11-year period?

How many inches tall was Adam Rainer "after" the ten years? ( )

How many inches did he grow during this time? – ( )

How many inches was he "before"? ( )

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Subtraction Word Problems #3

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

Answer Key

First problem:

$$\begin{array}{r} 5945 \\ -\ \ 63 \\ \hline 5882 \end{array}$$

Second problem:

$$\begin{array}{r} 85 \\ -\ 39 \\ \hline 46 \end{array}$$

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Subtraction Word Problems #4

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

Now you can write your own "before-and-after" problems. Use the facts about the world records for gems in the table below. Just fill in the blanks in the forms below the table. There you are! Solve these yourself on a separate sheet. Then try them on a friend!

The World's Greatest Gems

After a gem is found in the earth, it must be cut and polished before it is sold. The weight of a gem is measured in units called "carats."

Gem	Weight Before Cutting (in carats)	Weight After Cutting (in carats)
largest diamond	3,106	530
most expensive diamond	500	170
largest uncut sapphire	2,302	1,318
largest cut sapphire	2,097	1,444
largest topaz	179,169	21,327

First, fill in the blanks.

1 The world's _____ _____ weighed _____ carats when it was discovered. After it was cut, the gem weighed _____ carats. How many carats were cut out of the gem? Answer: _____ _____

Now, write your own!

2 First, talk about the gem before it was cut _____

_____

_____

3 Next, talk about the gem after it was cut _____

_____

_____

4 Now, ask the question _____

Answer: _____ _____ 20030

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Subtraction Word Problems #4

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

Answer Key

Answers will vary.

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Subtraction Word Problems #5

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

In some subtraction word problems you are given number information about a whole group or object. Then you are given a number connected with one of its parts. The answer to the problem is a number connected with the other part or parts of the whole.

For example:

The world's longest play is *The Warp* by Neil Oram. One performance of this play lasted 1,085 minutes. During this time there were three intermissions totaling 190 minutes. How many minutes did the rest of the play run?

1 In this problem, what is the length of the "whole" performance? ( )

How long in total were the intermission "parts"? − ( )

How long was the rest of the performance? ( )

Try another!

2 The world's tallest building, the Sears Tower in Chicago, has a tall TV antenna at the top. The overall height (with the antenna) is 1,559 feet. The antenna itself measures 105 feet. What is the height of the rest of the building? ( ) − ( ) ( )

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Subtraction Word Problems #5

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

Answer Key

1
$$\begin{array}{r} 1085 \\ -\ 190 \\ \hline 895 \end{array}$$

2
$$\begin{array}{r} 1559 \\ -\ 105 \\ \hline 1454 \end{array}$$

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Subtraction Word Problems #6

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

You can write your own "whole and part" word problem. Use these facts about the world's largest zoo to make up the problems. Solve them yourself on a separate piece of paper, then try them on a friend!

Zoological Society, London, England
Total number of animals: 10,968

Kinds of Animal	*Number*
mammals	2,154
birds	2,037
reptiles	587
fish	1,971
invertebrates	4,219

Fill in the blanks.

The zoo of the Zoological Society of London, England, has a collection of 10,968 animals.

_____ of these animals are _____. How many animals are there in the zoo besides _____?

Answer: _____

Now, try writing your own word problem.

Write about the whole number of animals. _____

_____

_____

Write about one of the parts. _____

_____

Ask the question. _____

Answer: _____

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Subtraction Word Problems #6

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

Answer Key

Answers will vary.

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Guinness Salad

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

Here is your chance to make the world's greatest salad! You will use some of the world's biggest vegetables. Below is a table of their weights:

Vegetable	**World Record Weight** (in pounds)
Lettuce	25
Carrot	11
Celery	35
Turnip	73
Cucumber	13
Tomato	7
*Total weight	164 lbs.

1 That's going to be a big salad-maybe *too* big!

Which vegetable would you have to take out to make the whole salad weigh only 129 pounds? (*Hint*: what number has to be subtracted from 164 to leave 129? Which vegetable weighs that many pounds?) Write your answer here: _____

2 Which vegetable would you take out to leave 153 pounds of salad? _____

3 Which vegetable would you take out to leave 91 pounds of salad? _____

4 Which vegetable would you take out to leave 139 pounds of salad? _____

5 Which vegetable would you take out to leave 157 pounds of salad? _____

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Guinness Salad

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

Answer key

1 Celery

2 Carrot

3 Turnip

4 Lettuce

5 Tomato

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The Guinness Zoo

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

It's feeding time at the Guinness Zoo, where all the World Record animals live.

You have seven animals to feed, and each one takes a different amount of food. Here's a list of the animals and the number of pounds of food each one eats:

Tiger (largest ever weighed 857 pounds) – 10 pounds of food

Gorilla (world's largest weighed 636 pounds) – 9 pounds of food

Crocodile (largest reported was 28 feet long) – 8 pounds of food

Yak (lives at higher altitude than any other mammal) – 7 pounds of food

Cheetah (fastest animal on land) – 6 pounds of food

Antelope (largest stood 65 inches tall) – 5 pounds of food

Ostrich (lays world's largest bird's egg) – 4 pounds of food

1 You are starting with 25 pounds of food. 25

Feed the Yak! –____

How many pounds do you have left?

Feed the Ostrich! –____

How many pounds now?

Feed the Cheetah! –____

How many pounds now?

Feed the Tiger! (careful, now!) –____

How many pounds now? ( )

2 Let's try again. Start with 35 pounds. Now feed the Antelope, the Gorilla, the Crocodile, the Cheetah, and the Ostrich. How many pounds of food left? _____
Work on the back of this sheet.

3 Now start with 20 pounds. Can you feed the Yak, the Crocodile, *and* the Cheetah?
_____ Work on the back of this sheet.

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The Guinness Zoo

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

Answer Key

1 27
− 7 (for the Yak)
20

− 4 (for the Ostrich)
16

− 6 (for the Cheetah)
10

− 10 (for the Tiger)
0

2 3 pounds

3 No.

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Guinness Zoo Group Game

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

Here is a game that two people can play. Once again, each player is feeding the animals at the Guinness Zoo. Here is a list of seven of the Guinness animals, along with the number of pounds of food each one eats:

Tiger (largest ever weighed 987 pounds)—10 pounds

Gorilla (world's largest weighed 636 pounds)—9 pounds

Crocodile (largest reported was 28 feet long)—8 pounds

Yak (lives at higher altitude than any other mammal)—7 pounds

Cheetah (fastest animal on land)—6 pounds

Antelope (largest stood 65 inches tall)—5 pounds

Ostrich (lays largest egg of any bird)—4 pounds

Here's how to play the game:

1 Each player begins by choosing the number of pounds of food he or she begins with. This can be a number between 20 and 35. Write this number down and keep it a secret!

2 Each player starts with the seven animals listed above. They take turns telling each other which animal to feed next. You "feed" an animal by subtracting the amount of food it eats from the number of pounds of food you have left. Then you cross that animal off your list so that you don't have to feed it again.

3 Each player takes four turns. After that, each player's score is the number of pounds of food he or she has left.

4 The object of the game is to get the other player's score as low as possible by having him or her feed four of the animals. But watch out! If you make the other player run out of food before your four turns are up, the game is over; your opponent scores seven points and you don't score any!

5 The winner of the game is the person with the most points at the end. Or, you can play many games in a row, starting with a new number of pounds of food each time; the first one to reach twenty points wins!

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Guinness Zoo Group Game

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

Answer Key

Answers will vary.

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Rounding

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

"Rounding a number to the nearest 10" means finding the multiple of 10 that is closest to that number. To do this, look at the ones digit. If the ones digit is less than 5, just replace it with a zero. If the ones digit is 5 or over, replace it with zero *and* add 1 to the tens digit. For example:

52 rounded to the nearest 10 is **50**
(2 is less than 5)

128 rounded to the nearest 10 is **130**
(8 is greater than 5)

Practice rounding the following numbers to the nearest 10.

1 318	5 86	9 42
2 21	6 95	10 139
3 555	7 107	11 153
4 284	8 623	12 16

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Rounding

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

Answer Key

1 320

2 20

3 560

4 280

5 90

6 100

7 110

8 620

9 40

10 140

11 150

12 20

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Rounding and Estimation

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

Rounding can be helpful at times when you want just to look at a subtraction problem and make a rough guess at what the answer will be. For example, look at this problem:

446 – 219 = ?

Round both of these numbers to the nearest 10. Now you have an easier subtraction problem:

450 – 220 = ?

The answer to this problem will be *about* the same as the answer to the first one. By working the problem with rounded numbers, you get a quick and close estimate of the answer.

Let's give this a try. First, rewrite the following problems using rounded numbers in place of the original numbers. (Do not solve the problems.)

1 206 – 84 = ? = ?

2 418 – 256 = ? = ?

3 133 – 27 = ? = ?

4 616 – 177 = ? = ?

5 213 – 91 = ? = ?

Now, look at each of the following subtraction problems and write down rough *estimates* of what the answers will be:

	ESTIMATE		ESTIMATE
6 358 – 24 = ?		11 496 – 215 = ?	
7 201 – 166 = ?		12 662 – 228 = ?	
8 528 – 398 = ?		13 319 – 255 = ?	
9 616 – 444 = ?		14 118 – 62 = ?	
10 108 – 72 = ?		15 824 – 771 = ?	

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Rounding and Estimation

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

Answer Key

1 210 – 80 = ?

2 420 – 260 = ?

3 130 – 30 = ?

4 620 – 180 = ?

5 210 – 90 = ?

6 340

7 30

8 130

9 180

10 40

11 280

12 430

13 60

14 60

15 50

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Selecting Word Problem Information

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

When a word problem contains more number information than you need to answer the question at the end, pay attention to the *units of measurement* used in the problem. See if the problem asks for an answer with a certain unit attached to it (such as "how many pounds?" or "how many inches?"). Then go back to the body of the problem. The numbers you need to get the answer will be labeled with that same unit.

As you read the following paragraphs, keep an eye out for the *units of measurement* attached to the numbers. Then answer the questions.

> The whale is the world's largest animal. One whale found in South America was about 110 feet long! The greatest recorded weight for a whale is another world record: 209 tons! The whale also has the world's heaviest brain. One whale's brain weighed 320 ounces. The world's heaviest human brain weighed only 72 ounces! Even a newborn whale weighs 3 tons.
>
> The whale also dives deeper than any other mammal. It dives as deep as 1,646 fathoms in the ocean. But not even a whale could reach the deepest spot in the Pacific Ocean. That place is 5,960 fathoms deep!
>
> For many years, men from many countries hunted whales. The biggest whale ever killed by a hunter (in 1920) was 97 feet long.

Question: How many tons heavier was the heaviest whale than a baby whale?

First, circle the unit of measurement in the question. Then write down the numbers from the paragraph that have the same unit attached to them: _____ _____

Now, set up and solve the subtraction problem:

$$\begin{array}{r} (\quad) \\ -\ (\quad) \\ \hline (\quad) \end{array}$$

You can use this method to answer the following questions:

1 How many feet longer was the longest whale than the one killed in 1920? _____

2 How many pounds heavier is a whale's brain than the heaviest human brain? _____

3 How many fathoms deeper than the deepest whale dive is the deepest spot in the ocean? _____

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Selecting Word Problem Information

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

Answer Key

The words *tons* should be circled in the question.

Numbers written down: 209 tons 3 tons

First problem:
$$\begin{array}{r} 209 \\ -\ \ 3 \\ \hline 206 \text{ tons} \end{array}$$

Other problems:

1 13 feet

2 248 ounces

3 4,314 fathoms

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Mental Subtraction #1

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

Sometimes it's very helpful to be able to solve subtraction problems without writing them out. Here is a trick to help you do this.

You know that a number like "784" can also be written in *expanded form*:

$$784 = 700 + 80 + 4$$

Look what happens when both terms of a subtraction problem are written in expanded form:

$$\begin{array}{r} 784 \\ -213 \\ \hline \end{array} \qquad \begin{array}{r} 700 + 80 + 4 \\ -200 + 10 + 3 \\ \hline 500 + 70 + 1 = 571 \end{array}$$

This way, you have 3 easy subtraction problems you can solve one at a time.

Try finding the answers to these "expanded-form" subtraction problems without working them out on paper:

1 $(900 + 10 + 5) - (200 + 10 + 2) =$ _____

2 $(600 + 90 + 6) - (500 + 50 + 0) =$ _____

3 $(500 + 60 + 8) - (400 + 20 + 1) =$ _____

4 $(500 + 20 + 8) - (100 + 60 + 4) =$ _____

5 $(500 + 20 + 8) - (300 + 40 + 5) =$ _____

The last of these problems involved regrouping. Using the expanded form can also help make regrouping a little easier:

$$\begin{array}{r} 800 \\ -560 \\ \hline \end{array} \qquad \begin{array}{r} 800 + 20 + 1 \\ -500 + 60 + 0 \\ \hline \end{array} \qquad \begin{array}{r} 700 + 120 + 1 \\ -500 + 60 + 0 \\ \hline 200 + 60 + 1 = 261 \end{array}$$

Now try solving the following problems without working them out on paper. Think of the numbers in expanded form and work the problem in steps, as shown above.

6 $626 - 512 =$ _____

9 $775 - 428 =$ _____

7 $918 - 620 =$ _____

10 $820 - 401 =$ _____

8 $144 - 26 =$ _____

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Mental Subtraction #1

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

Answer Key

First series of problems:

1 703

2 146

3 147

4 364

5 183

Second series:

6 114

7 298

8 118

9 347

10 419

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Mental Subtraction #2

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

The subtraction sentence "23 – 17 = 6" means that 6 is the *difference* between 23 and 17. If we add the same amount to the two numbers in a subtraction problem, the *difference* remains the same. For example:

$$\begin{array}{r} 23 \\ -17 \\ \hline 6 \end{array}$$ Now let's add 3 to both numbers: $$\begin{array}{r} 26 \\ -20 \\ \hline 6 \end{array}$$ The answer is still 6!

Notice another thing: the second problem is easier to do, because the number being subtracted is a multiple of 10.

You can use this idea to make any subtraction problem easier to do in your head. For example, take this problem:

$$\begin{array}{r} 41 \\ -26 \\ \hline ? \end{array}$$ Let's add 4 to both numbers: $$\begin{array}{r} 45 \\ -30 \\ \hline ? \end{array}$$

The *difference* is the same, but the problem is now easy enough to solve without working it out on paper, since the number being subtracted is a multiple of 10.

Try these. First, rewrite each problem so that the number being subtracted is a multiple of 10. Then, solve the problem.

1 124 – 37 = ? = ? Answer: _____

2 67 – 24 = ? = ? Answer: _____

3 251 – 66 = ? = ? Answer: _____

4 104 – 79 = ? = ? Answer: _____

5 616 – 254 = ? = ? Answer: _____

Now, use this method to solve the following subtraction problems without working them out on paper.

6 214 – 166 = _____

7 112 – 29 = _____

8 538 – 284 = _____

9 303 – 145 = _____

10 271 – 68 = _____

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Mental Subtraction #2

Use with the disks: **Problem Areas in Subtraction** (Mastery and Application)

Answer Key

1 127 – 40; answer = 87

2 73 – 30; answer = 43

3 255 – 70; answer = 185

4 105 – 80; answer = 25

5 622 – 260; answer = 362

6 48

7 83

8 254

9 158

10 203

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